

**144/430MHz DUAL BAND
FM TRANSCEIVER**

IC-3200A/E

SERVICE MANUAL

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FOREWORD

Thank you for selecting ICOM's versatile **IC-3200A/E**, one of the finest FM mobile transceivers on the market today.

Sophisticated in design, yet light, compact, and easy to operate, the **IC-3200A/E** benefits from the latest in ICOM engineering techniques and from ICOM's established leadership in the communications field.



The picture shows the IC-3200E version.

ASSISTANCE

Three separate versions of the **IC-3200A/E** have been designed for use in the U.S.A., Europe, and Australia. This service manual covers every version. When using the manual each model can be referred to by the following assigned version numbers:

- #03 U.S.A. version
- #04 EUROPE version
- #05 (VK) AUSTRALIA version

If you require assistance or information regarding the operation and capabilities of the **IC-3200A/E**, please contact your nearest authorized ICOM Dealer or ICOM Service Center.

TABLE OF CONTENTS

| | | |
|----------------|--|------------------|
| SECTION | 1 SPECIFICATIONS | 1 — 1 |
| | 1-1 GENERAL | 1 — 1 |
| | 1-2 TRANSMITTER | 1 — 1 |
| | 1-3 RECEIVER | 1 — 1 |
| SECTION | 2 OPERATING CONTROLS AND INDICATORS | 2 — 1 ~ 2 |
| | 2-1 FRONT PANEL | 2 — 1 |
| | 2-2 DISPLAY | 2 — 2 |
| | 2-3 REAR PANEL | 2 — 2 |
| SECTION | 3 CIRCUIT DESCRIPTION | 3 — 1 ~ 6 |
| | 3-1 RECEIVER CIRCUITS | 3 — 1 |
| | 3-2 TRANSMITTER CIRCUITS | 3 — 1 |
| | 3-3 PLL (PHASE-LOCKED LOOP) CIRCUITS | 3 — 3 |
| | 3-4 LOGIC CIRCUITS | 3 — 4 |
| SECTION | 4 VOLTAGE/CIRCUIT DIAGRAMS | 4 — 1 ~ 9 |
| | 4-1 WIRING DIAGRAM | 4 — 1 |
| | 4-2 EF (VOL AND SQL) UNITS | 4 — 2 |
| | 4-3 MAIN (UHF) UNIT | 4 — 3 |
| | 4-4 MAIN (VHF) UNIT | 4 — 4 |
| | 4-5 PLL-YGR (UHF) UNIT | 4 — 5 |
| | 4-6 PLL-YGR (VHF) UNIT | 4 — 6 |
| | 4-7 LOGIC A UNIT | 4 — 7 |
| | 4-8 LOGIC B UNIT | 4 — 8 |
| | 4-9 PA (UHF, VHF) UNITS | 4 — 9 |
| SECTION | 5 MAINTENANCE AND ADJUSTMENT | 5 — 1 ~ 7 |
| | 5-1 PREPARATION BEFORE SERVICING | 5 — 1 |
| | 5-2 PLL ADJUSTMENT | 5 — 2 |
| | 5-3 RECEIVER ADJUSTMENT | 5 — 3 |
| | 5-4 TRANSMITTER (UHF BAND) ADJUSTMENT | 5 — 4 |
| | 5-5 TRANSMITTER (VHF BAND) ADJUSTMENT | 5 — 6 |
| SECTION | 6 TROUBLESHOOTING | 6 — 1 ~ 2 |
| SECTION | 7 INSIDE VIEWS | 7 — 1 ~ 4 |
| | 7-1 MAIN UNIT | 7 — 1 |
| | 7-2 PLL-YGR UNIT (IC-3200A/VK VERSIONS) | 7 — 2 |
| | 7-3 PLL-YGR UNIT (IC-3200E VERSION) | 7 — 3 |
| | 7-4 LOGIC UNITS | 7 — 4 |
| SECTION | 8 DISASSEMBLY AND ASSEMBLY DIAGRAMS | 8 — 1 ~ 4 |
| | 8-1 FRAME DISASSEMBLY | 8 — 1 |
| | 8-2 FRONT PANEL DISASSEMBLY | 8 — 2 |
| | 8-3 MAIN UNIT CONNECTOR ASSEMBLY | 8 — 3 |
| | 8-4 PLL-YGR CONNECTOR ASSEMBLY | 8 — 4 |

| | | |
|----------------|-----------------------------------|--------------------|
| SECTION | 9 BOARD LAYOUTS | 9 — 1 ~ 6 |
| | 9-1 MAIN UNIT | 9 — 1 |
| | 9-2 PLL-YGR UNIT | 9 — 2 |
| | 9-3 LOGIC A UNIT | 9 — 3 |
| | 9-4 LOGIC B UNIT | 9 — 3 |
| | 9-5 PA (VHF) UNIT | 9 — 4 |
| | 9-6 PA (UHF) UNIT | 9 — 4 |
| | 9-7 TX VCO UNIT | 9 — 5 |
| | 9-8 RX VCO UNIT | 9 — 5 |
| | 9-9 EF (VOL) UNIT | 9 — 6 |
| | 9-10 EF (SQL) UNIT | 9 — 6 |
| SECTION | 10 BLOCK DIAGRAM | 10 — 1 |
| SECTION | 11 IC RATINGS | 11 — 1 ~ 11 |
| SECTION | 12 OPTIONAL UNITS | 12 — 1 ~ 2 |
| SECTION | 13 PARTS LIST | 13 — 1 ~ 10 |
| | EF (VOL AND SQL) UNITS | 13 — 1 |
| | MAIN UNIT | 13 — 1 |
| | RX VCO UNIT | 13 — 3 |
| | TX VCO UNIT | 13 — 4 |
| | PLL-YGR UNIT | 13 — 4 |
| | LOGIC A UNIT | 13 — 7 |
| | LOGIC B UNIT | 13 — 8 |
| | PA (UHF AND VHF) UNITS..... | 13 — 9 |
| SECTION | 14 SCHEMATIC DIAGRAM | SEPARATE |

SECTION 1 SPECIFICATIONS

1 - 1 GENERAL

| Number of semiconductors | : | Transistors 49 FETs 10 Diodes 85 | | | | | | | | | | | | | | | | |
|---|------------|---|--------------------------|------|--------------------------|--------------------------|--------------------|------------|--------------------------------|--------------------|--------------------|------------|--------------------------------|------------|----------------|------------|--------------------------------|---------|
| Frequency coverage and Channel resolution | : | <table><tr><th>VERSION</th><th>BAND</th><th>FREQUENCY COVERAGE (MHz)</th><th>CHANNEL RESOLUTION (kHz)</th></tr><tr><td>IC-3200A U.S.A.</td><td>VHF UHF</td><td>140.0 ~ 150.0 440.0 ~ 450.0</td><td>15 or 5 25 or 5</td></tr><tr><td>IC-3200E EUROPE</td><td>VHF UHF</td><td>144.0 ~ 146.0 430.0 ~ 440.0</td><td>25 or 12.5</td></tr><tr><td>IC-3200A VK</td><td>VHF UHF</td><td>144.0 ~ 148.0 430.0 ~ 440.0</td><td>25 or 5</td></tr></table> | VERSION | BAND | FREQUENCY COVERAGE (MHz) | CHANNEL RESOLUTION (kHz) | IC-3200A U.S.A. | VHF UHF | 140.0 ~ 150.0 440.0 ~ 450.0 | 15 or 5 25 or 5 | IC-3200E EUROPE | VHF UHF | 144.0 ~ 146.0 430.0 ~ 440.0 | 25 or 12.5 | IC-3200A VK | VHF UHF | 144.0 ~ 148.0 430.0 ~ 440.0 | 25 or 5 |
| VERSION | BAND | FREQUENCY COVERAGE (MHz) | CHANNEL RESOLUTION (kHz) | | | | | | | | | | | | | | | |
| IC-3200A U.S.A. | VHF UHF | 140.0 ~ 150.0 440.0 ~ 450.0 | 15 or 5 25 or 5 | | | | | | | | | | | | | | | |
| IC-3200E EUROPE | VHF UHF | 144.0 ~ 146.0 430.0 ~ 440.0 | 25 or 12.5 | | | | | | | | | | | | | | | |
| IC-3200A VK | VHF UHF | 144.0 ~ 148.0 430.0 ~ 440.0 | 25 or 5 | | | | | | | | | | | | | | | |
| Usable temperature range | : | -10°C +60°C (+14°F~140°F) | | | | | | | | | | | | | | | | |
| Frequency control | : | Micro computer-based 5kHz steps (or 12.5kHz steps) Digital PLL synthesizer with independent dual VFO capability | | | | | | | | | | | | | | | | |
| Frequency stability | : | Within ±0.001% | | | | | | | | | | | | | | | | |
| Power supply requirement | : | 13.8V DC ±15% (negative ground) 7.5A maximum | | | | | | | | | | | | | | | | |
| Current drain (13.8V DC) | : | Transmitting HIGH (25W) : Approx. 7.5A LOW (5W) : Approx. 3.5A Receiving At max. audio output : Approx. 0.65A Squelched : Approx. 0.5A | | | | | | | | | | | | | | | | |
| Memory channels | : | 10 channels with any in-band frequency programmable | | | | | | | | | | | | | | | | |
| Antenna impedance | : | 50Ω unbalanced | | | | | | | | | | | | | | | | |
| Weight | : | 1.9kg | | | | | | | | | | | | | | | | |
| Dimensions | : | 140(140)mm(W) x 50(50)mm(H) x 207(218)mm(D) Bracketed values include projections | | | | | | | | | | | | | | | | |

1 - 2 TRANSMITTER

| | | |
|--------------------------|---|---|
| Output power | : | HIGH: 25W, LOW: 5W |
| Emission mode | : | 16F3 (F3E 16K0) |
| Modulation system | : | Variable reactance frequency modulation |
| Max. frequency deviation | : | ±5kHz |
| Spurious emissions | : | More than 60dB below carrier |
| Microphone | : | 600 Ω electret condenser microphone with Push-To-Talk and frequency UP/DOWN SWITCHES IC-3200A (U.S.A. version only): 16 key DTMF pad IC-3200E: 1750Hz Tone Burst unit |
| Operating modes | : | Simplex, Semi-duplex, Programmable |

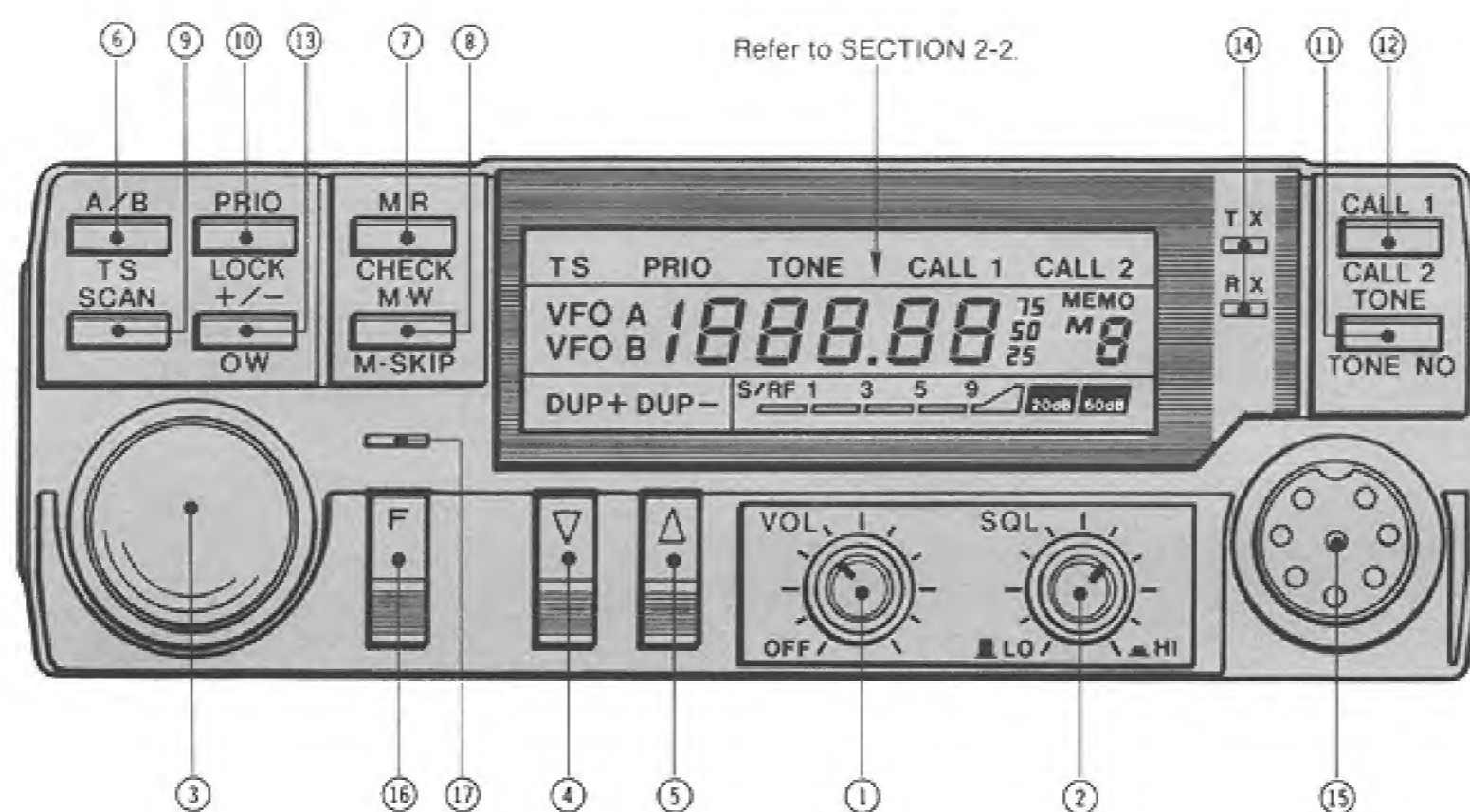
1 - 3 RECEIVER

| | | |
|--------------------------|---|---|
| Receiving system | : | Double-conversion superheterodyne |
| Modulation acceptance | : | 16F3 (F3E 16K0) |
| Intermediate frequencies | : | 1st: 30.875MHz 2nd: 455kHz |
| Selectivity | : | More than 15kHz at -6dB point Less than 30kHz at -60dB point |
| Sensitivity | : | Less than 0.2μV for 12dB SINAD Less than 0.4μV for 20dB noise quieting |
| Audio output power | : | More than 1.7W at 10% distortion with 8Ω load |
| Audio output impedance | : | 4~8Ω |

NOTE: Specifications are approximate and are subject to change without notice or obligation.

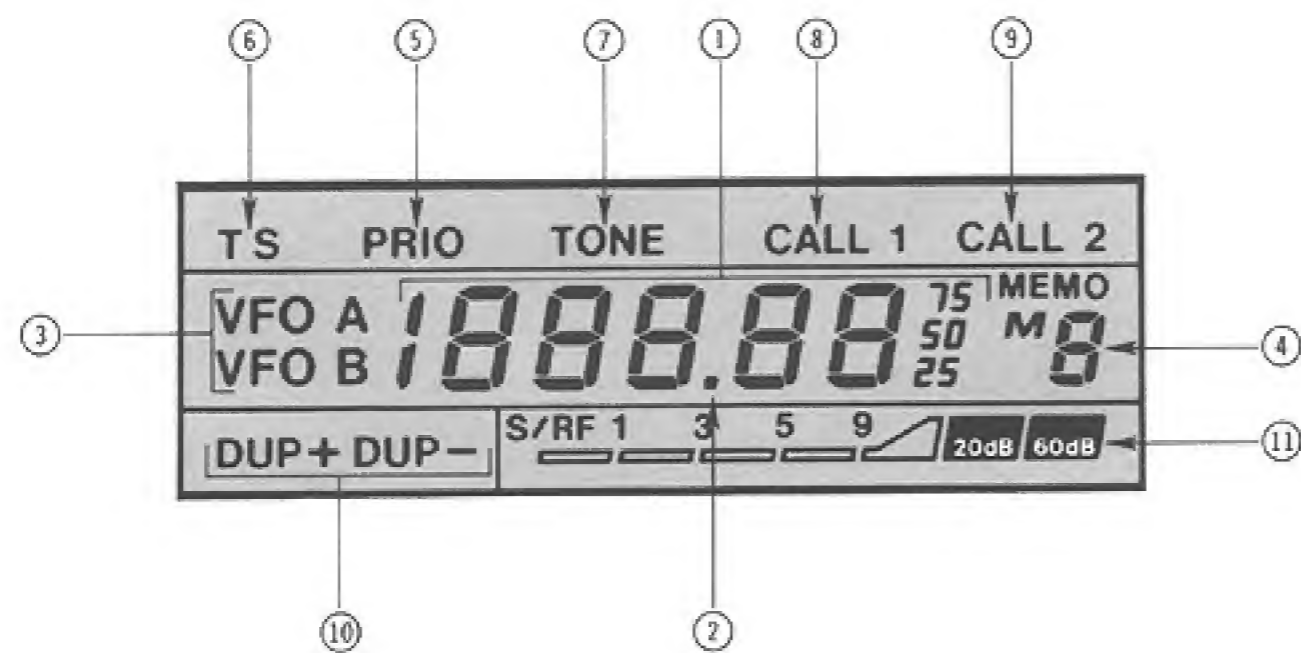
SECTION 2 OPERATING CONTROLS AND INDICATORS

2 - 1 FRONT PANEL



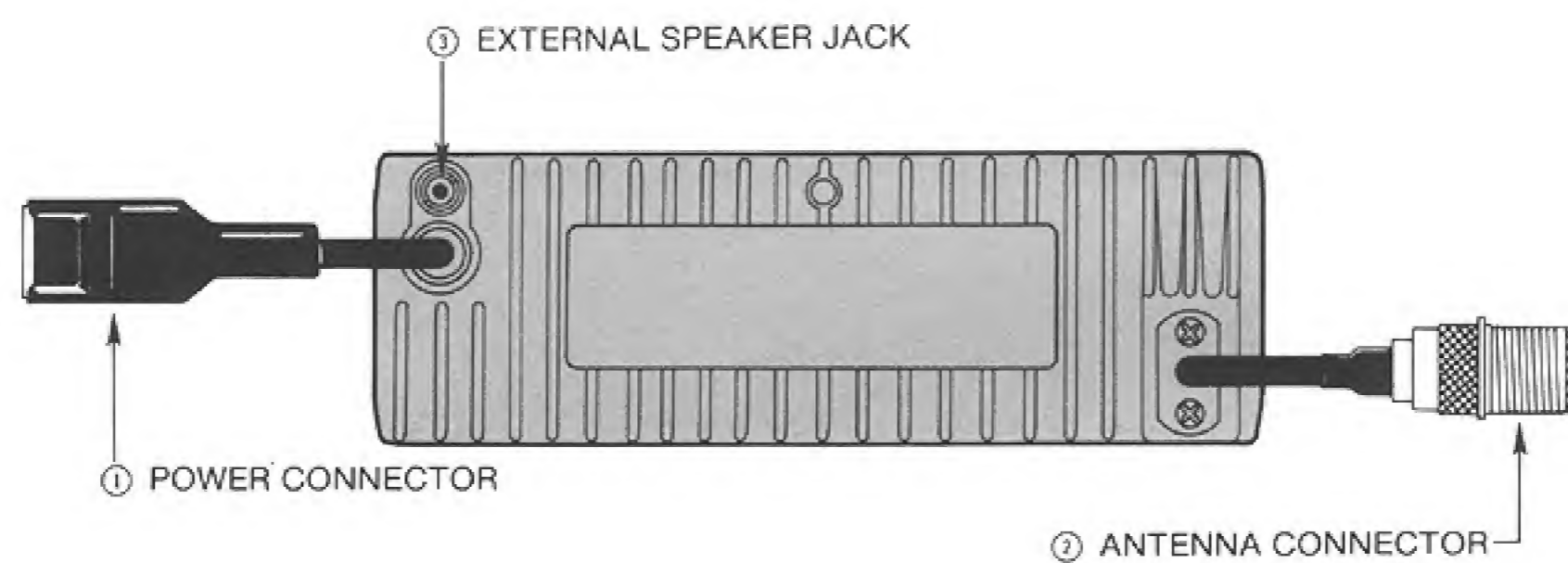
- ① VOLUME AND POWER CONTROL
- ② SQUELCH AND RF POWER CONTROL
- ③ TUNING CONTROL
- ④ MHz DOWN SWITCH
- ⑤ MHz UP SWITCH
- ⑥ A/B AND TUNING SPEED SWITCH
- ⑦ MEMORY READ AND OFFSET CHECK SWITCH
- ⑧ MEMORY WRITE AND MEMORY SKIP SWITCH
- ⑨ SCAN AND SELECTIVE MEMORY SCAN SWITCH
- ⑩ PRIORITY AND LOCK SWITCH
- ⑪ CALL 1 AND CALL 2 SWITCH
- ⑫ TONE SWITCH AND OFFSET WRITE SWITCH
- ⑬ OFFSET AND OFFSET WRITE SWITCH
- ⑭ TRANSMIT AND RECEIVE INDICATORS
- ⑮ MIC CONNECTOR
- ⑯ FUNCTION SWITCH
- ⑰ FUNCTION LED INDICATOR

2 - 2 DISPLAY



- ① FREQUENCY DISPLAY
- ② FUNCTION INDICATOR
- ③ VFO INDICATORS
- ④ MEMORY CHANNEL INDICATOR
- ⑤ PRIO INDICATOR
- ⑥ TS INDICATOR
- ⑦ TONE INDICATOR
- ⑧ CALL 1 INDICATOR
- ⑨ CALL 2 INDICATOR
- ⑩ DUPLEX INDICATORS (+/-)
- ⑪ S/Rf LEVEL METER

2 - 3 REAR PANEL



- ① POWER CONNECTOR
- ② ANTENNA CONNECTOR
- ③ EXTERNAL SPEAKER JACK

SECTION 3 CIRCUIT DESCRIPTION

3 - 1 RECEIVER CIRCUITS

3 - 1 - 1 VHF ANTENNA SWITCHING CIRCUIT (PA UNIT)

Incoming VHF signals from the antenna connector are passed through a Chebyshev Low-pass filter consisting of L3, L4, L6, C12, C13, C14, and C15, and are fed to the antenna switching circuit. While receiving, D2 is turned ON. Receive signals from a low-pass filter are passed through another filter consisting of C10, L2 and C17, and are fed to J1 on the MAIN UNIT.

3 - 1 - 2 VHF RF AMPLIFIER CIRCUIT (MAIN UNIT)

Signals from J1 are passed through the L1-L2 bandpass filter, and are amplified by Q1. Amplified signals from Q1 are passed through the L3-L4-L5 bandpass filter, and are mixed with the local oscillator signal from the PLL circuit in Q2 to produce a first IF signal of 30.875MHz.

3 - 1 - 3 UHF ANTENNA SWITCHING CIRCUIT (PA UNIT)

Incoming VHF signals from the antenna connector are passed through both a Chebyshev low-pass filter consisting of L13, L14, C35, C36 and C37 and a Chebyshev low-pass filter consisting of L11, L13, C32, C33 and C34 before being fed into the antenna switching circuit. While receiving, D5 is turned OFF. Receive signals from the low-pass filter are passed through another filter consisting of L10, C30, C39 and C40, and are fed to J3 on the MAIN UNIT.

3 - 1 - 4 UHF RF AMPLIFIER CIRCUIT (MAIN UNIT)

Signals from J3 are passed through a tuned circuit consisting of L11, C21 and C22, and the output is amplified by Q5. The output from Q5 is passed through bandpass filter L13, amplifier Q6, bandpass filter L15, and is mixed with the local oscillator signal from the PLL UNIT to produce a first IF signal of 30.875MHz.

3 - 1 - 5 IF AMPLIFIER CIRCUIT (MAIN UNIT)

The first IF signal from the mixer is passed through the L8-C12 tuned circuit, is filtered by crystal filter FI1, is passed through the L9-C15 tuned circuit, and is amplified by Q4. D3 and D4 function as a limiter for strong signals. The amplified signal from Q4 is fed to pin 16 of IC1. IC1 incorporates a second oscillator, a second mixer, a limiter and a discriminator on a single chip. The signal from pin 16 of IC1 is mixed with the second oscillator signal to produce the 455kHz signal at pin 3 on IC1. The 455kHz signal is filtered by ceramic filter FI2 and is fed to pin 5 of IC1 where it then enters the limiter amplifier. The amplified signal is fed to the discriminator through ceramic discriminator unit X1. The audio signal exits from pin 9 on IC1.

3 - 1 - 6 AUDIO AMPLIFIER CIRCUIT (MAIN UNIT)

The audio signal from pin 9 on IC1 is amplified by Q10, is

filtered by active filter Q11, and is fed through J7 and the VOLUME CONTROL to pin 1 on IC5. IC5 is the audio power amplifier. The amplified audio signal from IC5 is fed to the speaker through J10.

3 - 1 - 7 SQUELCH CIRCUIT (MAIN UNIT)

The audio signal from pin 9 on IC1 is also fed to the noise amplifier through C69, R50, J8, C70, and the SQUELCH CONTROL and then is input to pin 10 on IC1. The amplified noise signal exits from pin 11 on IC1, is rectified by D11 and D12, and is controlled by Q9 through R54.

3 - 1 - 8 S-METER CIRCUIT (MAIN UNIT)

S-meter signals from pin 5 on IC1 are amplified by IC3 through C66 and R49, are passed through L20, are rectified by D9 and D10, and are fed to the LCD driver circuit on the LOGIC A UNIT through J12. In the VHF mode, the band signal turns ON Q12 to adjust the gain of IC3 by means of R82, equalizing the S-meter level between VHF and UHF.

3 - 2 TRANSMITTER CIRCUITS

3 - 2 - 1 MIC AMPLIFIER CIRCUIT (PLL UNIT)

The microphone output is fed into IC5A through C60 and the Q8 amplifier. IC5A includes a differential amplifier and a limiter amplifier with R2 as the UHF deviation gain adjustment and R3 as the VHF deviation gain adjustment. Preemphasis of 6dB/octave is introduced between 300Hz and 3kHz. The signal is then fed to the FM modulator in the TX VCO UNIT through a low-pass filter consisting of IC5B, R45, R46, R49, C51, C52, and C53.

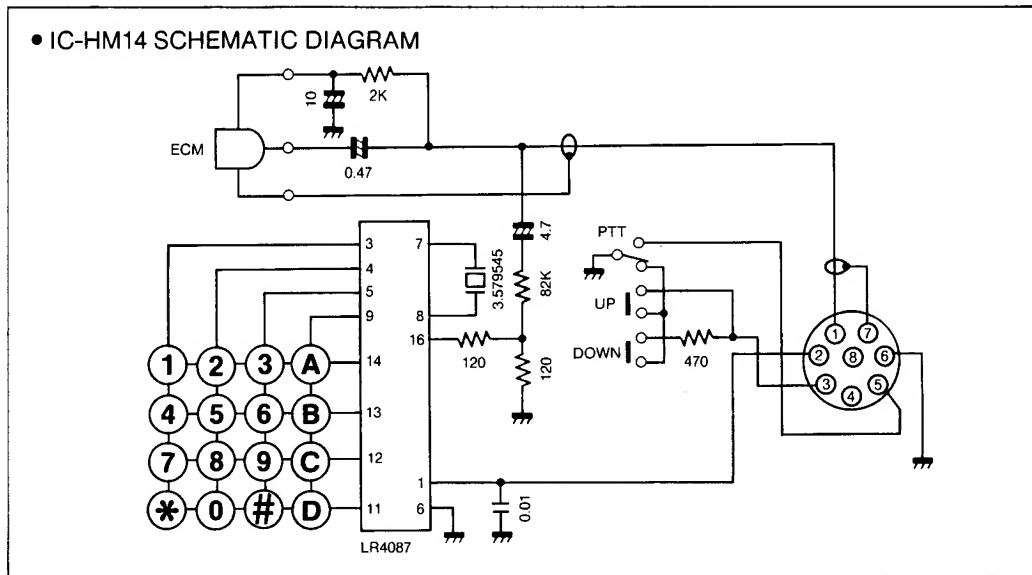
3 - 2 - 2 MICROPHONES USED WITH THE IC-3200A/E

The IC-3200A/E comes factory equipped with a high-quality electret condenser microphone. The type of supplied microphone varies with each transceiver model. The microphone types are listed below.

| | |
|----------------|-------------------------------|
| IC-3200A (#03) | : IC-HM14 (DTMF Encoder) |
| IC-3200E (#04) | : IC-HM15 (1750Hz Tone Burst) |
| IC-3200A (#05) | : IC-HM12 |

1. IC-HM14 (DTMF Encoder) MIC

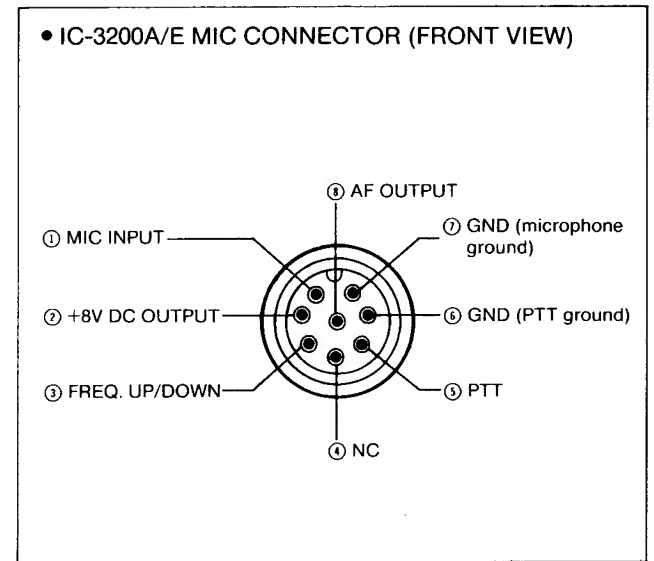
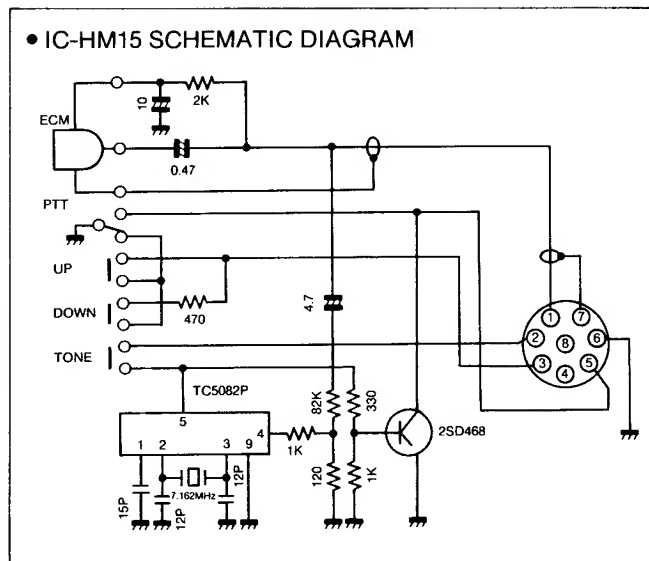
Plug the IC-HM14 into the MIC CONNECTOR on the front panel for immediate transceiver operation. If you wish to use a different microphone with the IC-3200A, be sure it has the proper output level before making any connections. Particular care should be exercised when wiring a different microphone since the internal electrical switching system in the transceiver depends on proper connections being made. See the diagram on page 3-2 for proper MIC wiring instructions.



2. IC-HM15 (1750Hz Tone Burst) MIC

The IC-HM15 is equipped with a 1750Hz tone burst switch for convenient access to repeaters. Refer to the IC-HM15

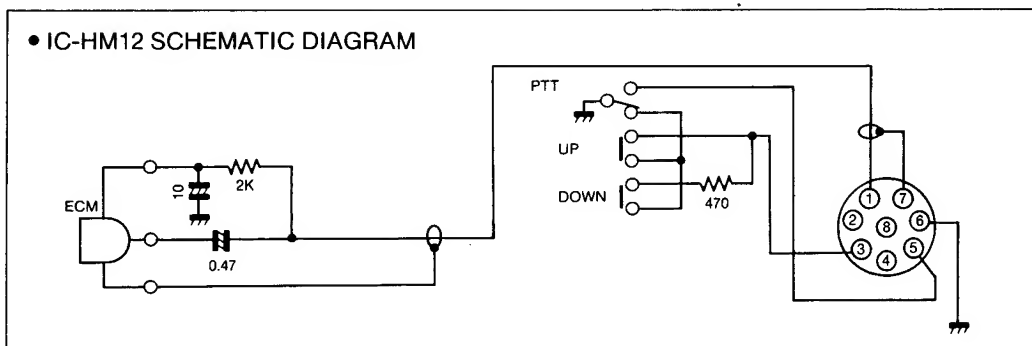
schematic diagram below for information regarding its internal wiring and components.



3. IC-HM12 (Electret Condenser) MIC

Refer to the schematic diagram below for information

regarding the internal wiring and components in the IC-HM12.



3 - 2 - 3 MULTIPLIER AND DRIVER CIRCUITS

1. VHF Circuit

The RF signal from the PLL UNIT is amplified by IC1 on the VHF PA UNIT to obtain 25W, and the output from pin 4 on IC1 is fed to the ANT switching circuit. In the transmit mode D2 and D4 in the T/R switching circuit are turned ON, and L2 and C2 become a parallel resonant circuit. The output power from pin 4 on IC1 is fed to the antenna terminal through the bandpass filter.

2. UHF Circuit

The RF signal from the PLL UNIT is amplified by IC2 on the UHF PA UNIT to obtain 25W, and the output from pin 5 on IC2 is fed to the ANT switching circuit. In the transmit mode, D5 and D7 in the T/R switching circuit are turned ON, and L15 and C41 become a parallel resonant circuit. The output power from pin 5 on IC2 is fed to the antenna terminal through the bandpass filter.

3. VHF/UHF ALC (Automatic Level Control) Circuit (PA UNITS AND MAIN UNIT)

This circuit stabilizes the output power even when the power supply voltage or the antenna impedance is fluctuating. The varying current from the power amplifier at R1 (VHF) and R6 and R11 (UHF) is amplified by the IC2B (VHF) or IC2A (UHF) differential amplifiers on the MAIN UNIT. The output voltage is fed to Q1 (VHF) or Q3 (UHF) which control the current to the module's driver stage, maintaining constant RF power.

4. VHF/UHF RF Meter Circuit (PA UNITS AND MAIN UNIT)

A sample of the RF output power is fed to D3 (VHF) or D6 (UHF) through C9 (VHF) or C27 (UHF), is rectified, and is passed to the module's driver stage to maintain constant RF power.

5. Power Supply Circuit (MAIN UNIT)

The 13.8V from the DC connector is applied to IC4 on the MAIN UNIT through filters consisting of L22, C97, and R89. This causes 9V to be fed to the MAIN and PLL-YGR UNITS.

3 - 3 PLL (PHASE-LOCKED LOOP) CIRCUITS

3 - 3 - 1 PLL

The PLL is designed so that the desired frequency is generated directly by the VCO using a dual modulation prescaler system, and is composed of the IC2 prescaler IC and the IC1 PLL IC. The PLL circuit is fed "divided-by-N" DATA from the CPU to determine the operating frequency. N-DATA is the ratio of the desired frequency (the transmit frequency in transmit mode and the first local oscillator frequency in receive mode) and the reference frequency.

$$N = \frac{\text{Desired frequency}}{\text{Reference frequency}}$$

Crystal X1 oscillates in Q1 and its output signal is divided by a dividing circuit in IC1 that obtains a reference frequency of 5kHz for the IC-3200A (6.25kHz for the IC-3200E version).

The signal from the VCO that is buffer-amplified at Q6 is divided N times at IC2 and IC1. The signal inside IC1 is phase detected and the detected signal is output from pin 11 on IC1. The output signal is applied to the TX D1 and TX D2 varactor diodes (or RX D1 and RX D2) in the VCO and is passed through the Q2-Q3 loop filter to control the VCO frequency.

3 - 3 - 2 VCO/FM MODULATION CIRCUITS

The VCO is composed of the following circuits: VHF RX, UHF RX, VHF TX, and UHF TX. A PD signal from the PLL is fed to the varactor diode connected to each drain of the FETs to control the VCO frequency.

1. Dual Modulus Prescaler

IC2 is a dual modulus prescaler that divides the signal generated by the VCO by either 64 or 65. The VHF receive range is 102.125~119.125MHz and the transmit range is 140.00~150.00MHz. The UHF receive range is 409.125~419.125MHz and the transmit range is 440.00~450.00MHz. IC1 is a CMOS LSI chip designed for use as a frequency synthesizer. It incorporates a 6-bit swallow counter, an 11-bit programmable counter, a phase comparator, a charge pump, and a frequency divider for the reference frequency. The reference frequency from Q1 is fed to pin 15 on IC1. Here the frequency is divided by 1024, the reference frequency becomes 5kHz (6.25kHz for the IC-3200E version), and the frequency is fed to pin 2 on IC1.

2. VHF/UHF RX VCO Circuit

The RX VCO is a Clapp oscillator circuit which oscillates in the VHF range 107.125~119.125MHz or in the UHF range 409.125~419.125MHz. The frequency is controlled by the DC voltage from VRXC on IC3. The drains of Q1 (VHF) and Q4 (UHF) receive a positive 9V while the transceiver is in the receive mode and Q2 (VHF) or Q4 (UHF) are turned ON. Thus the frequency is generated when the FET source is at ground level.

3. VHF/UHF TX VCO Circuit

The TX VCO is a Clapp oscillator circuit. The frequency is controlled by the DC voltage from V-VCO-C or U-VCO-C from IC3. When the drains of Q6 (VHF) or Q3 (UHF) receive a positive 9V, Q4 (VHF) or Q3 (UHF) turns ON. The VHF oscillator frequency (140~150MHz) is fed out through C17 and the UHF oscillator frequency (440~450MHz) is fed out through the Q2 multiplier amplifier.

4. Low-pass Filter Circuit

The local oscillator signal from the RX VCO (VHF: 102.125~119.125, UHF: 409.125MHz) is divided by 2 by the Q2 multiplier amplifier. The VHF local oscillator signal is fed to J2 on the MAIN UNIT through D13 and a low-pass filter consisting of L12, L13, C99, C100 and C101. The UHF local oscillator signal is fed to J4 on the MAIN UNIT through D12 and a low-pass filter consisting of L10, L11, C94, C95, and C96.

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5. Tone Circuit

IC-3200A Version:

The CTCSS tone circuit is composed of IC7 and IC8. When a tone number is selected, data is sent to IC7 from the CPU. IC7 carries out serial/parallel conversion on the data from the CPU and the results are fed to IC8. IC8 divides the X2 frequency (3.579545MHz) by an amount related to the data from the CPU, and the output is fed from pin 1. The CTCSS tone output level is controlled by R42, then the signal is fed to the TX VCO UNIT.

| TONE NO. | FREQUENCY (Hz) | TONE NO. | FREQUENCY (Hz) | TONE NO. | FREQUENCY (Hz) |
|----------|----------------|----------|----------------|----------|----------------|
| 1 | 67.0 | 15 | 110.9 | 29 | 179.9 |
| 2 | 71.9 | 16 | 114.8 | 30 | 186.2 |
| 3 | 74.4 | 17 | 118.8 | 31 | 192.8 |
| 4 | 77.0 | 18 | 123.0 | 32 | 203.5 |
| 5 | 79.7 | 19 | 127.3 | 33 | 210.7 |
| 6 | 82.5 | 20 | 131.8 | 34 | 218.1 |
| 7 | 85.4 | 21 | 136.5 | 35 | 225.1 |
| 8 | 88.5 | 22 | 141.3 | 36 | 233.6 |
| 9 | 91.5 | 23 | 146.2 | 37 | 241.8 |
| 10 | 94.8 | 24 | 151.4 | 38 | 250.3 |
| 11 | 97.4 | 25 | 156.7 | | |
| 12 | 100.0 | 26 | 162.2 | | |
| 13 | 103.5 | 27 | 167.9 | | |
| 14 | 107.2 | 28 | 173.8 | | |

IC-3200E Version:

The 1750Hz tone-burst circuit is composed of IC8, Q23, and Q24. IC8 is preset for 1750Hz and outputs the tone signal from pin 1. When the [TONE] SWITCH on either the microphone or front panel of the IC-3200E is pushed, IC8 generates a tone and Q24 simultaneously makes a SEND line to ground level, putting the transceiver in transmit mode. The 1750Hz tone output level is controlled by R42 and the signal is then fed to the TX VCO UNIT.

6. Voltage Regulator Circuit (PLL-YGR UNIT)

The supply voltage for the PLL-YGR UNIT includes 10 different values: 13.8V, common 9V, 6V, VR8V, UR8V, VT8V, UT8V, +8V, UT13.8V, and T8V. These voltages are supplied to each unit. A common 9V from IC4 on the MAIN UNIT is supplied to the PLL-YGR UNIT. This 9V is connected to the emitters of Q14 (VT8V), Q13 (UT8V), Q10 (VR8V), and Q9 (VR8V). 13.8V is connected to the emitters of Q11 (VT13.8V) and Q12 (VT13.8V). Q9, Q10, Q11, Q12, Q13, and Q14 are PNP transistors which turn ON when their bases are grounded. The voltage is fed out from the collectors of each transistor. The bases of Q9~Q14 are controlled by IC4 and IC3. IC4 has seven inverter transistors so that when a HIGH level is applied to IC4 from IC3, the output voltage is LOW. IC3 is composed of two decoders and a demultiplexer.

IC3 produces a 4-bit binary output with two inputs (A and B). This input is controlled by three signals: SEND (RX: HIGH, TX: LOW), TX (RX: LOW, TX: HIGH) and BAND A/B (VHF: LOW, UHF: HIGH). When the PLL is out of lock, the ENABLE TERMINAL of IC3 is HIGH, and all output terminals are LOW.

3 - 4 LOGIC CIRCUITS

3 - 4 - 1 CPU

The CPU on the LOGIC B UNIT is a 4-bit CMOS CPU with an LCD driver. The initialization matrix on the LOGIC B UNIT selects the version of the transceiver, and the main matrix on the LOGIC A and LOGIC B UNITS controls the functions of the transceiver.

The CPU controls the PLL, CTCSS and speech synthesizer circuit by means of serial data through IC4D and IC4E on the LOGIC B UNIT.

1. Memory Backup for CPU

A lithium battery (BT1 on the LOGIC B UNIT) is for memory backup when the transceiver is turned OFF. The memory backup mode begins when a pulse is applied to the INTO port on the CPU, stopping the CPU and saving memory data.

3 - 4 - 2 LOGIC A UNIT

1. Stop Circuit

The stop circuit consists of IC3B, IC4B, IC5B, Q7, Q8, and D10. IC3B, Q7, and Q8 function as a NOR gate. D5 and R29 function as an OR gate. IC5B is a Schmitt trigger circuit that uses the junction voltage of D1 as a reference voltage. Therefore, if the 5V line on the LOGIC A UNIT is more than 4V, IC5B feeds out a HIGH level and the one shot circuit consisting of IC4C, C5, and R28 feeds a pulse to the INTO port on the CPU to cancel the CPU mode.

The cathode of D11 is connected to the LCD mute port on the CPU. When the CPU is in the stop mode, the mute port is HIGH but when the stop mode is cancelled, the mute port is LOW. Also, the output level from the IC3, Q7, and Q8 NOR gate is LOW. IC4B is a buffer amplifier which drives Q7. If the supplied voltage to IC5 on the LOGIC A UNIT drops below 3.8V, the output level from IC5 will be LOW and the output level from IC3B will be HIGH. Therefore, the CPU will activate the stop mode. When the CPU is in the stop mode, the LCD mute port on the CPU is HIGH, and the output from IC3B is LOW.

2. TX/RX Switching Circuit

When the PTT SWITCH on the microphone is pushed, pin 5 of J1 becomes LOW and the collector of Q4 becomes HIGH. Q3 reverses this signal to supply the transmit mode signal to the SEND port on the CPU.

3. TX Control

Pin 13 on IC3A is connected to the MUTE port on the CPU to eliminate unwanted signals from being transmitted. If an out-of-band frequency is selected, the output level from IC3A stays LOW to mute the transmit signal when the PTT SWITCH on the microphone is pressed.

4. Power ON Reset Circuit

When the transceiver is turned ON, a signal from IC4C is supplied to IC3C and the main matrix on the LOGIC A UNIT. If the FUNCTION SWITCH is pressed when the transceiver is being switched ON, IC3 sends a reset signal to the CPU.

5. Scan Stop Circuit

When the SQL S signal from the MAIN UNIT is HIGH, it turns ON Q6 and passes the signal to the SCAN STOP port on the CPU. Also, Q6 controls the D13 receive LED.

6. Mic UP/DOWN Circuit

When the UP/DOWN SWITCH on the microphone is pressed, a signal is supplied to the MIC CK port on the CPU. When the UP SWITCH is pushed, the collector of IC5 becomes HIGH. When the DOWN SWITCH is pushed, the collector of IC5 becomes LOW. The CPU receives this signal from the U/D port on the CPU to control the microphone scanning function.

3 - 4 - 3 LOGIC B UNIT

1. Initial Matrix Circuits

IC1, the BCD-To-Decimal Decoder on the LOGIC B UNIT, decodes the initial matrix signal generated by the following diodes on each IC-3200 version:

(1) Q0 → Ax (BAND A/VHF)

This matrix sets the frequency bandwidth on the VHF (BAND A).

NOTE: The value of x will vary with each transceiver version.

(2) Q1 → Ax (BAND B/UHF)

This matrix sets the frequency bandwidth on the UHF (BAND B).

(3) Q4 → A1 (Ax) (REFERENCE A)

This matrix sets the frequency step and reference frequency of the PLL circuit on BAND A. When the matrix (especially Q4 → A1) is ON, a reference frequency of 6.25kHz is selected; when Q4 → A1 is OFF, a reference frequency of 5kHz is selected.

Q4 → Ax

This matrix sets the frequency step on BAND A.

(4) Q5 → A1 (Ax)

This matrix sets the frequency step and the reference frequency of the PLL circuit on BAND B. When the matrix (especially Q5 → A1) is ON, a reference frequency of 6.25kHz is selected; when Q5 A1 is OFF, a reference frequency of 5kHz is selected.

Q5 → Ax (REFERENCE B)

This matrix sets the frequency step on BAND B.

(5) Q6 → A2 (OW A)

This matrix sets the offset frequency in duplex mode on BAND A when transceiver power is turned ON. When the matrix Q6 A1 is ON, an offset frequency of 600kHz is selected.

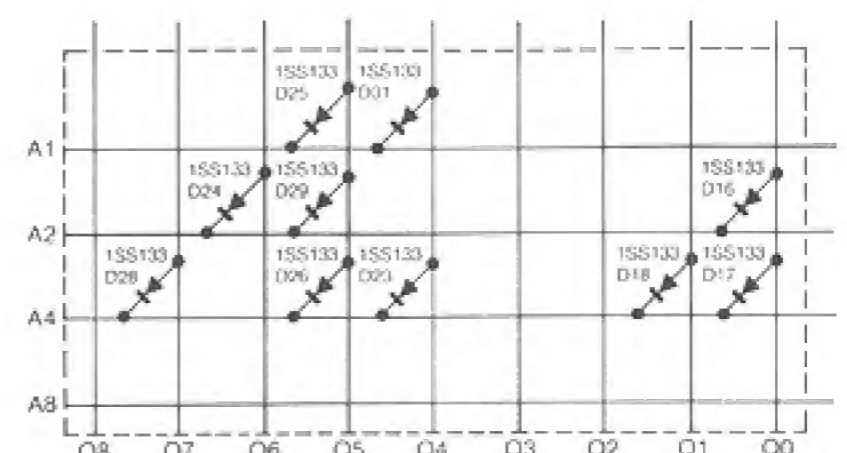
(6) Q7 → A1(A4) (OW B)

This matrix sets the offset frequency in duplex mode on BAND B when transceiver power is turned ON. When the matrix Q7 A4 is ON, an offset frequency of 5.0MHz is selected. When both Q7 A1 and Q7 A4 are ON, an offset frequency of 7.6MHz is selected for the IC-3200E version.

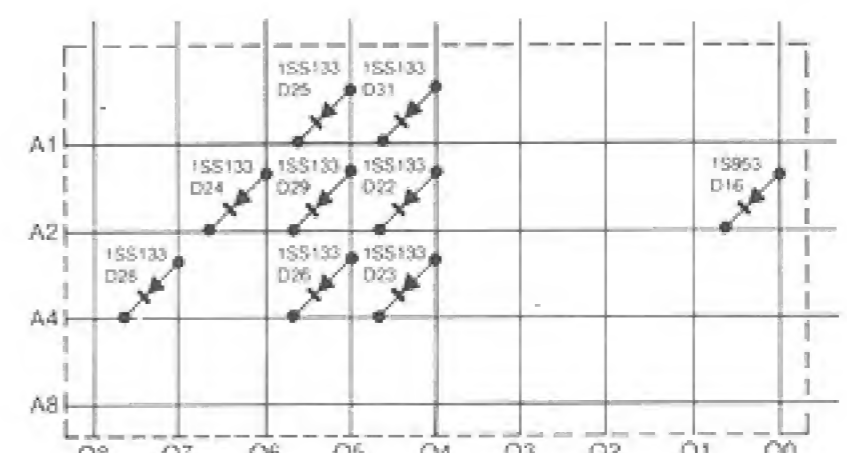
(7) Q9 → A1 (VOICE SYNTHESIZER ON/OFF)

This matrix sets the ON or OFF condition for the signals of the voice synthesizer unit. When the matrix is OFF, no data signals for the voice synthesizer are output. When the matrix is ON, the data signals are output.

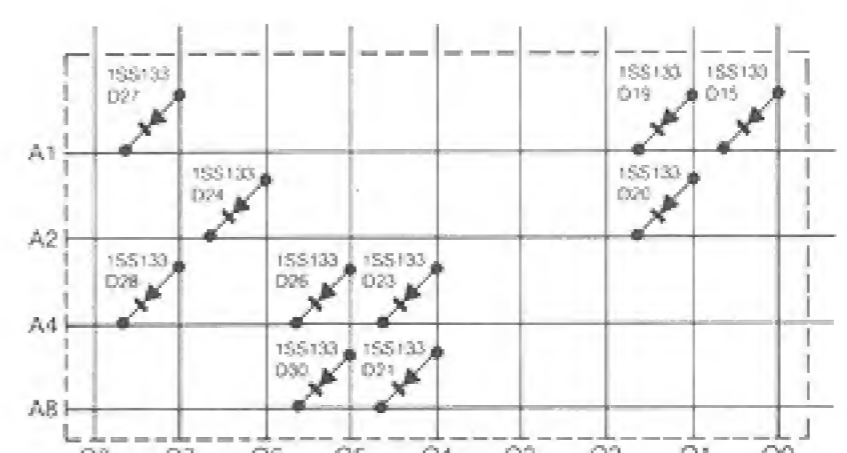
IC-3200A



IC-3200A (VK)



IC-3200E



2. Matrix Switch

The matrix data from the LOGIC B UNIT are fed to B1, B2, and B4 on the CPU through S1 to activate the scan speed, the scan timer, and the memory lock functions.

3. Busy Matrix for the Speech Synthesizer

When the speech synthesizer is activated, it sends a busy signal to D3, and turns ON D1 B2 on the main matrix by means of Q1. This alerts the CPU that the synthesizer is activated. The CPU waits until the busy signal is LOW before continuing.

4. BEEP Circuit

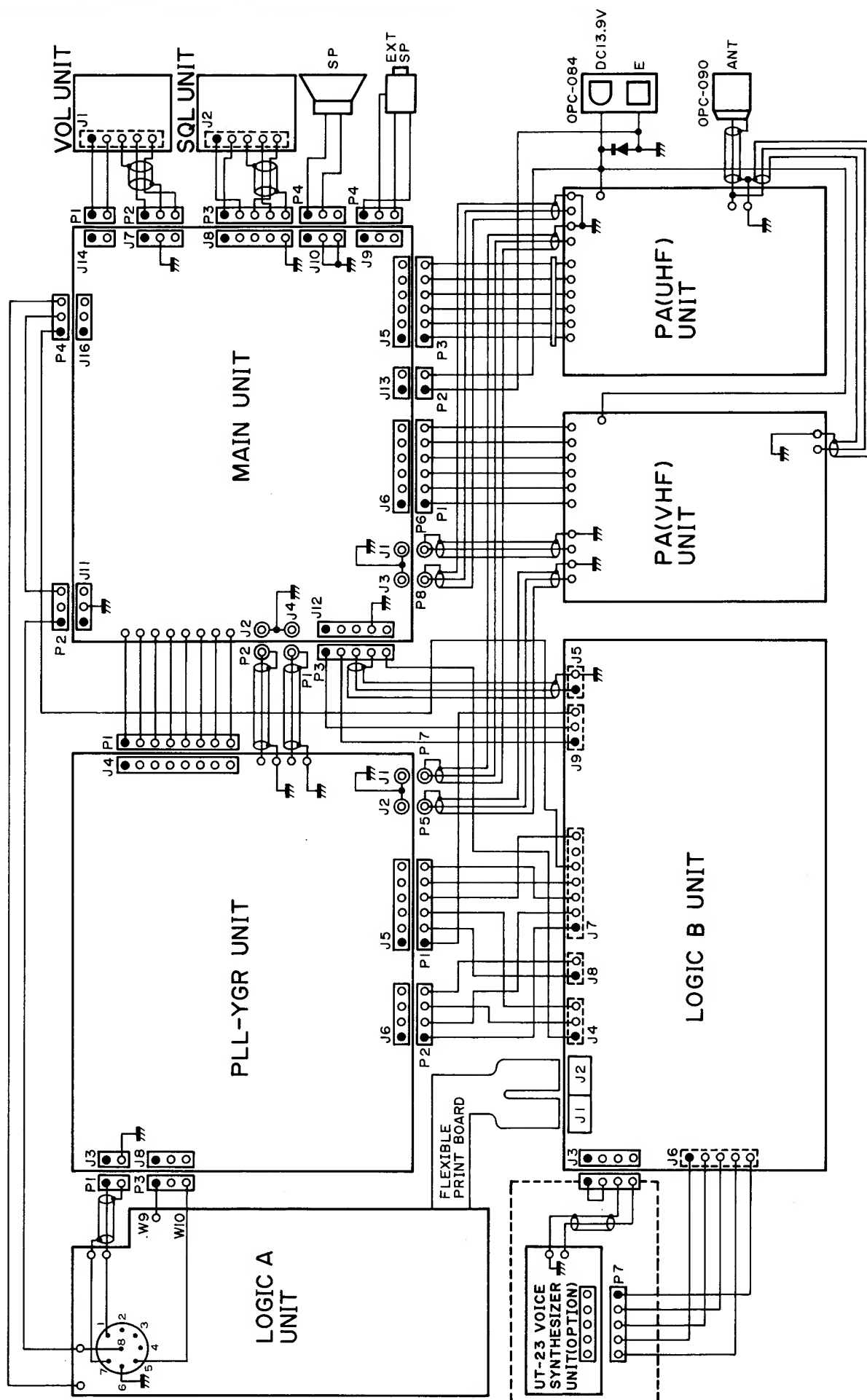
The BEEP circuit is a phase oscillator consisting of IC3D, R5, R6, R7, C9, C10, and C11 which feeds out a signal to Q13 on the MAIN UNIT when the control gate is HIGH.

5. DIAL Clock Circuit

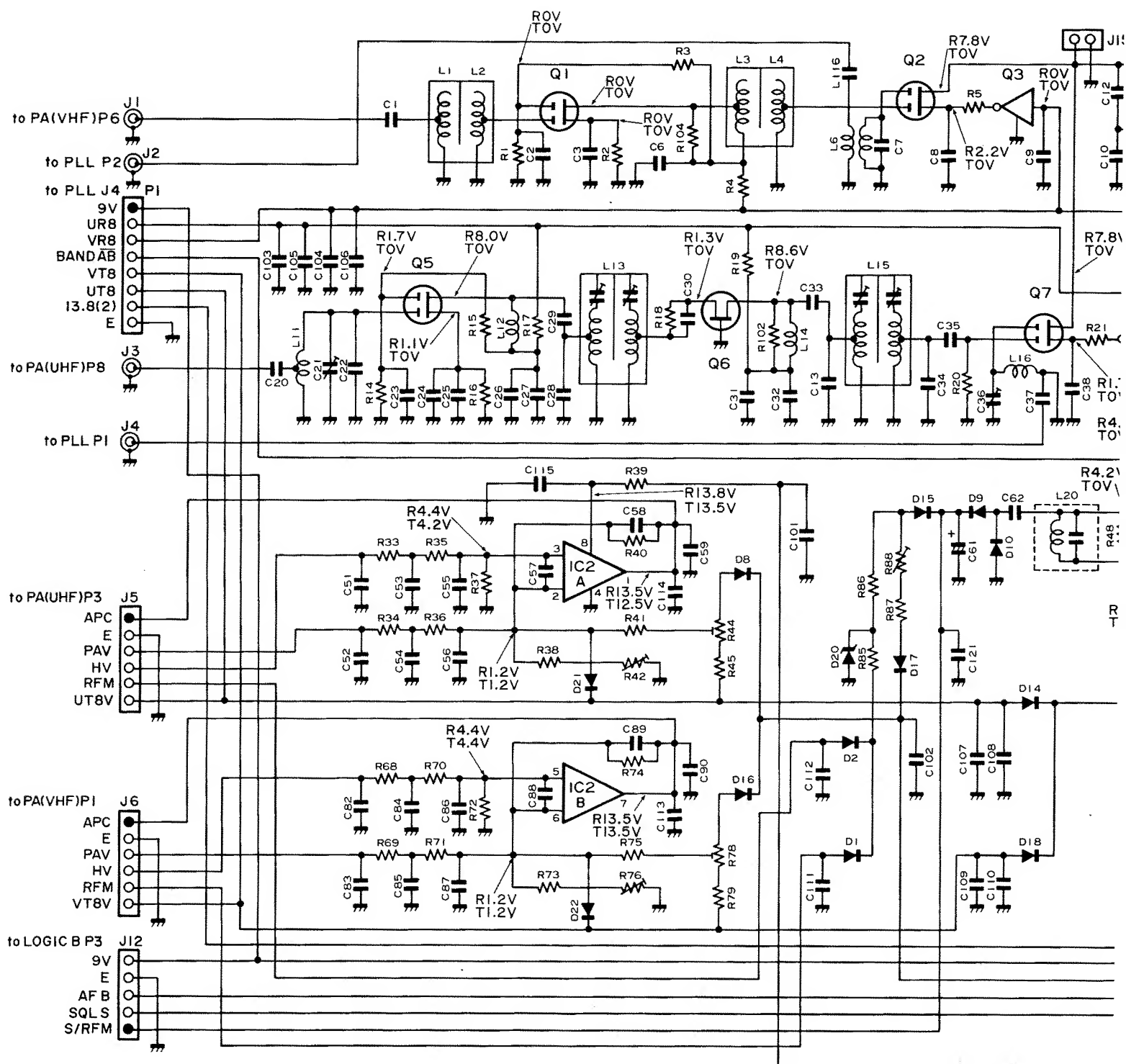
This circuit consists of IC2, IC3, Q2, R9, R10, R11, C6 and C7, which form the rotary encoder. When turning the encoder dial, one shot pulses are generated from IC2A. Meanwhile, Q2 generates a HIGH or LOW signal to the U/D port on the CPU for UP or DOWN tuning. Also, IC2A sends sensor signals to the CK port on the CPU.

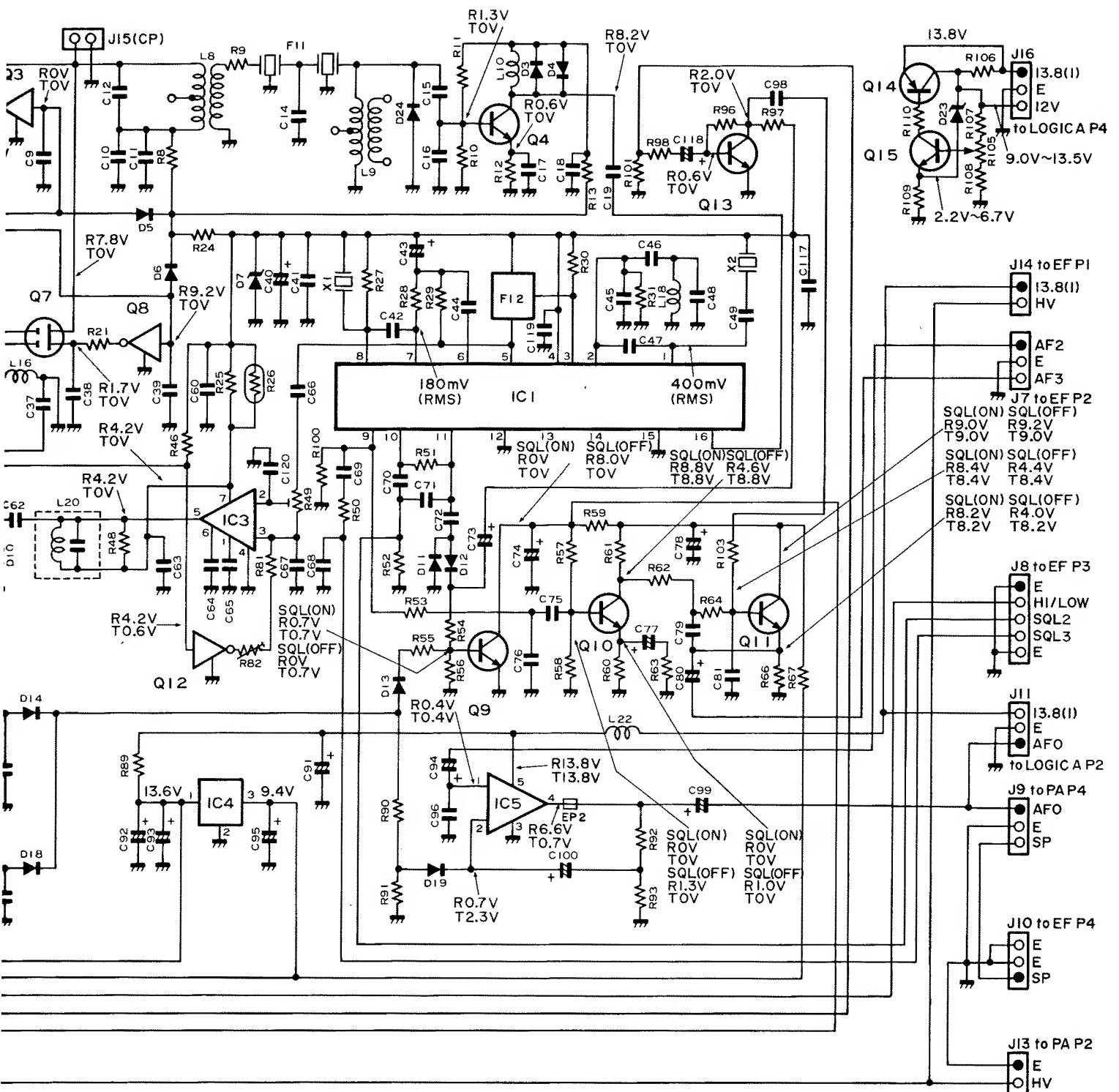
SECTION 4 VOLTAGE/CIRCUIT DIAGRAMS

4 - 1 WIRING DIAGRAM



4 - 3 MAIN (UHF) UNIT



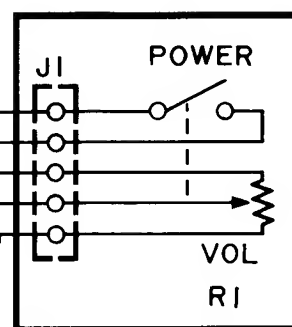
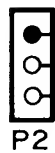


4 - 2 EF (VOL AND SQL) UNITS

(VOL UNIT)

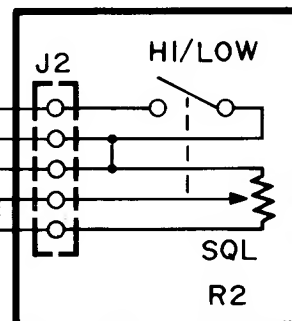
to MAIN J14
13.8(1)
HV

AF2
E
AF3
to MAIN J7

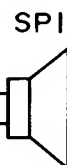


(SQL UNIT)

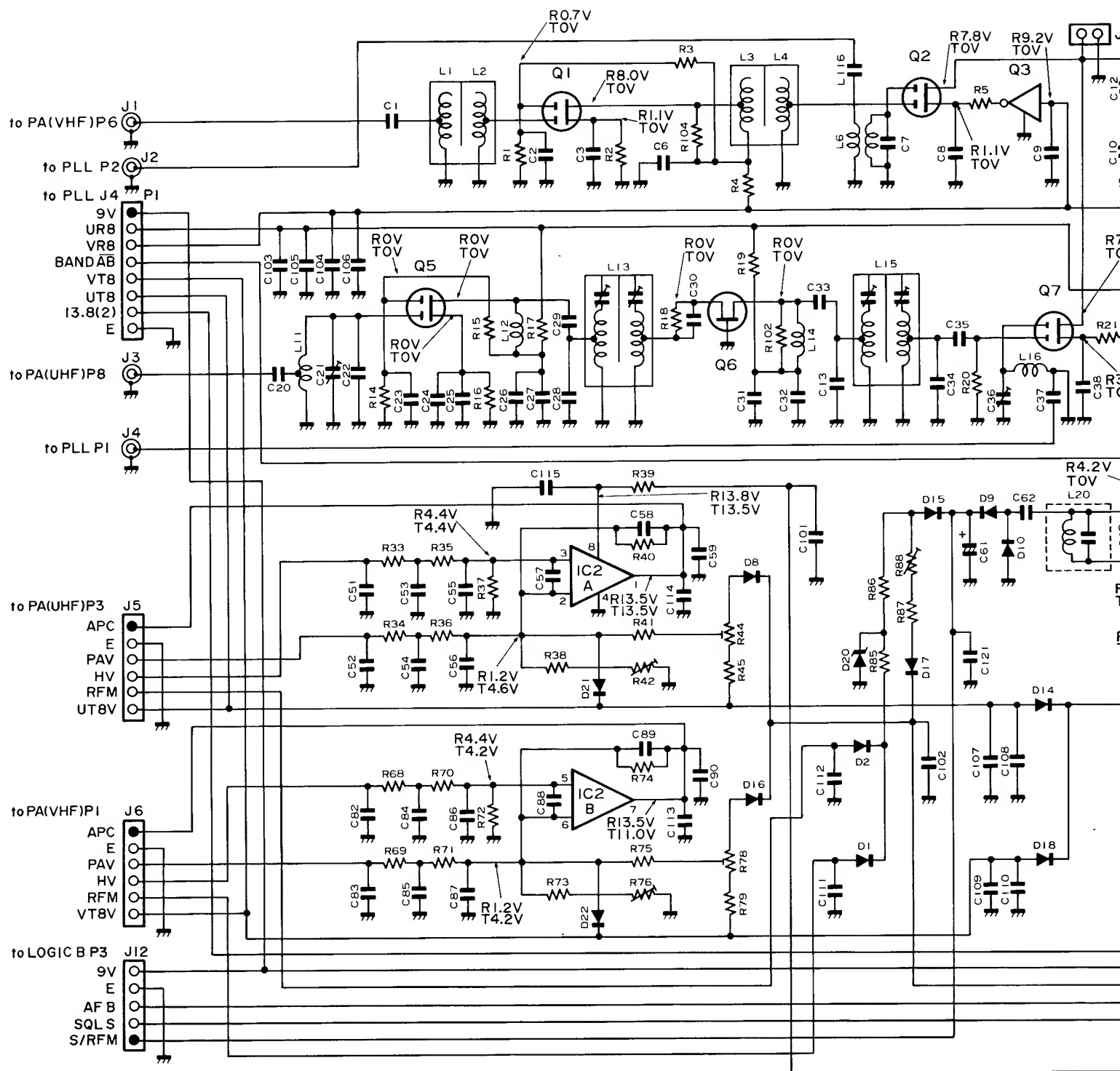
to MAIN J8
E
HI/LOW
SQL2
SQL3
E



to MAIN J10
SP
E



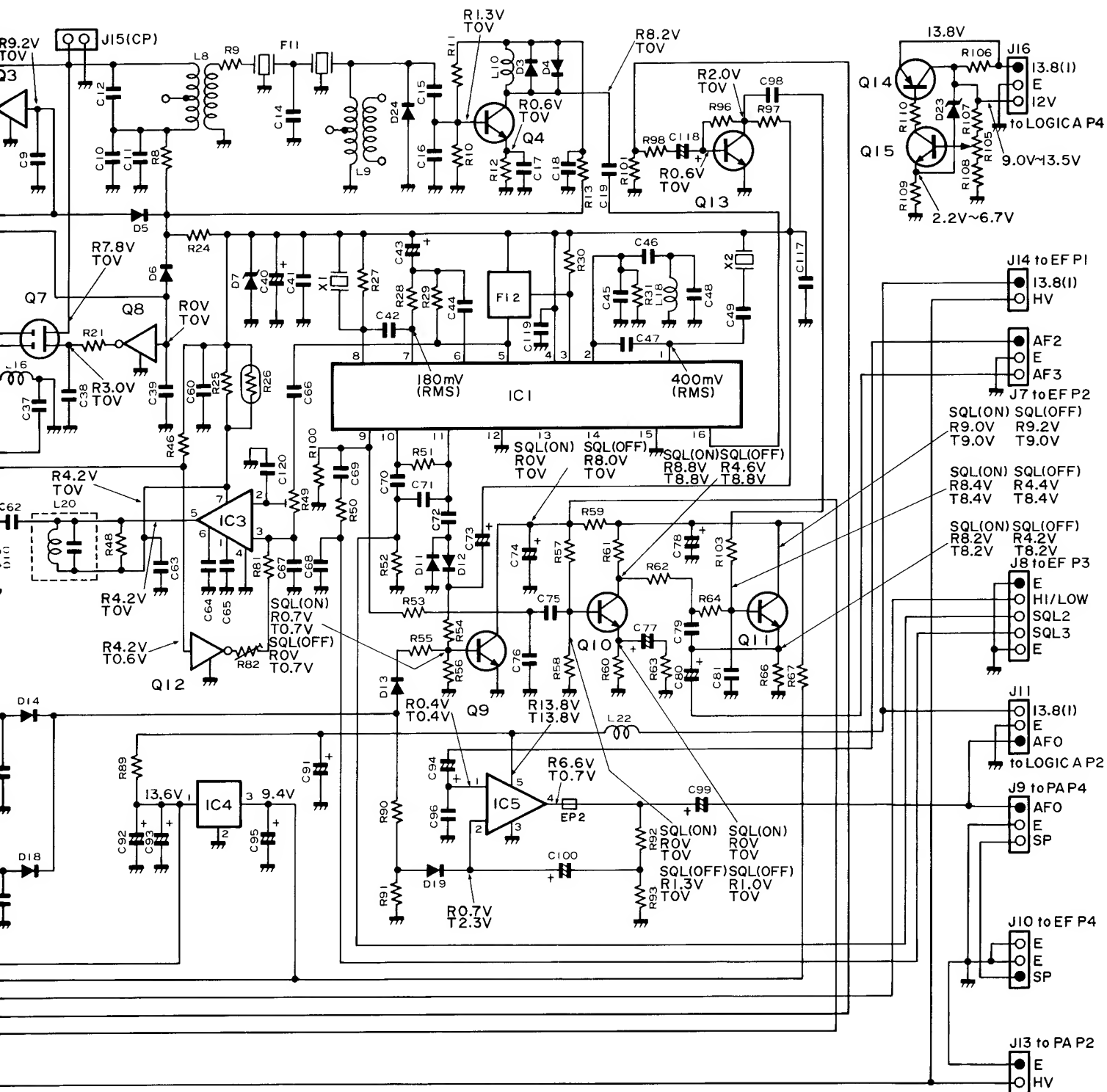
4 - 4 MAIN (VHF) UNIT



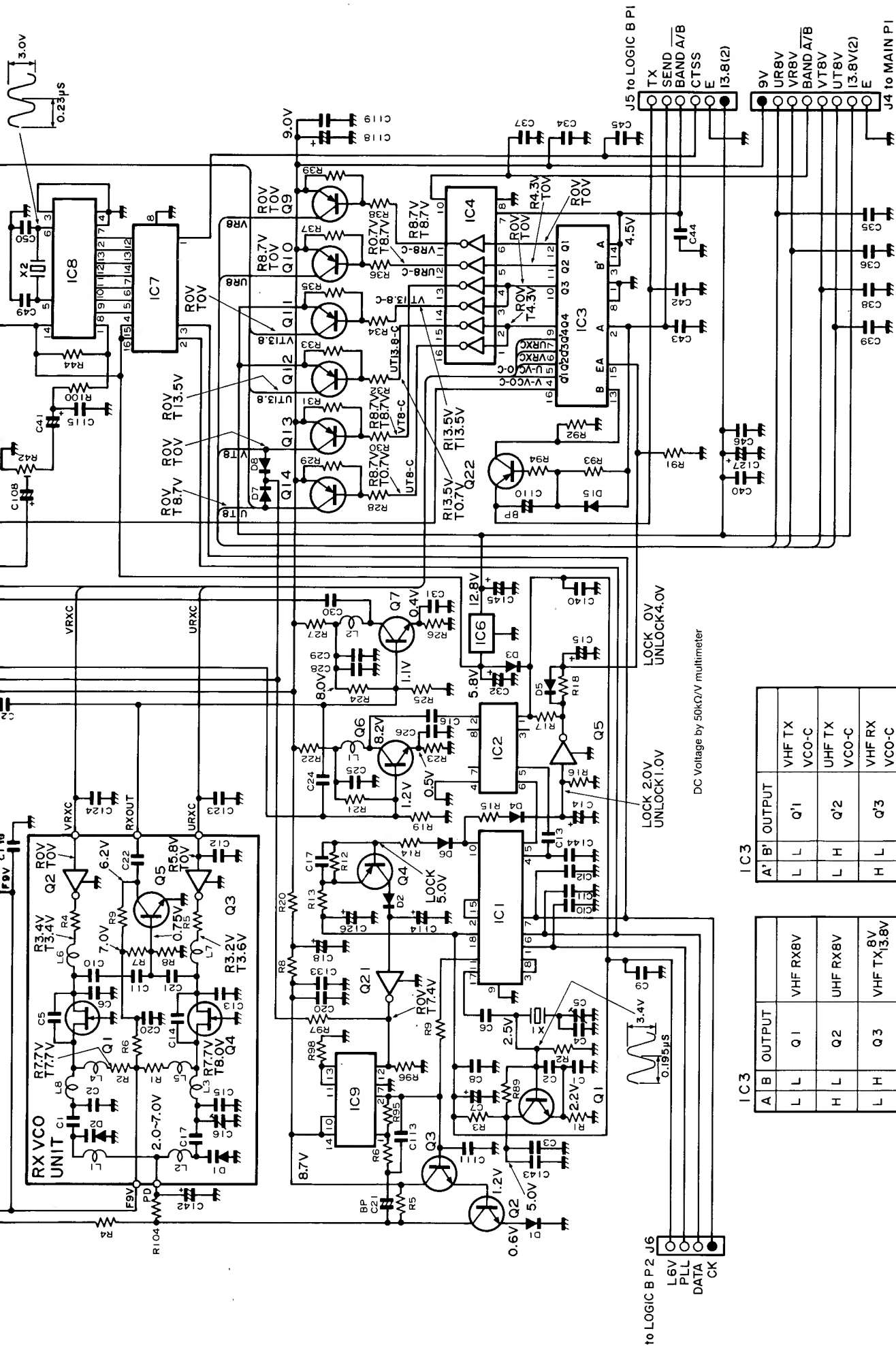
ICI

DC Voltage by 50k Ω /V multimeter

[illegible]





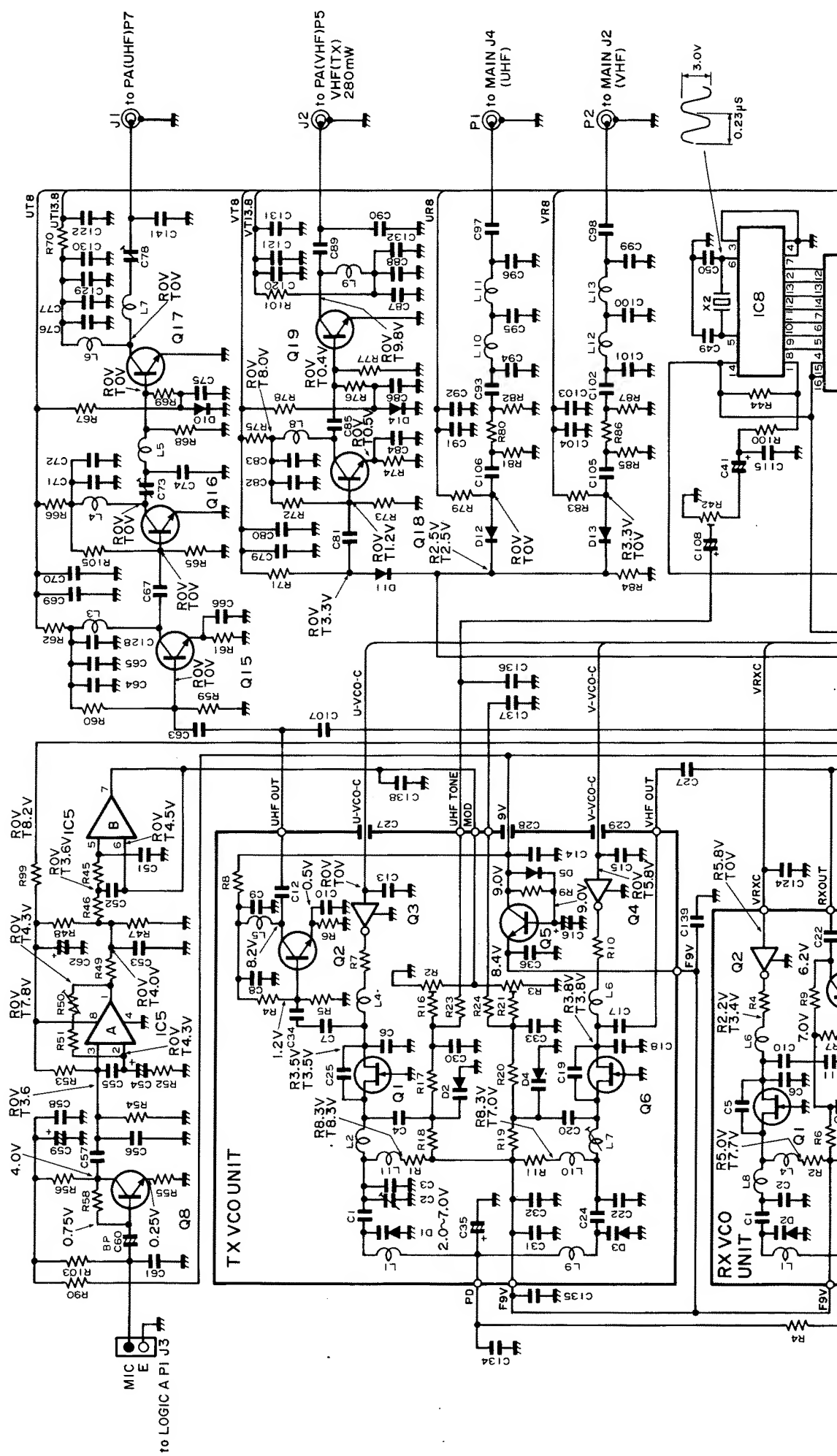


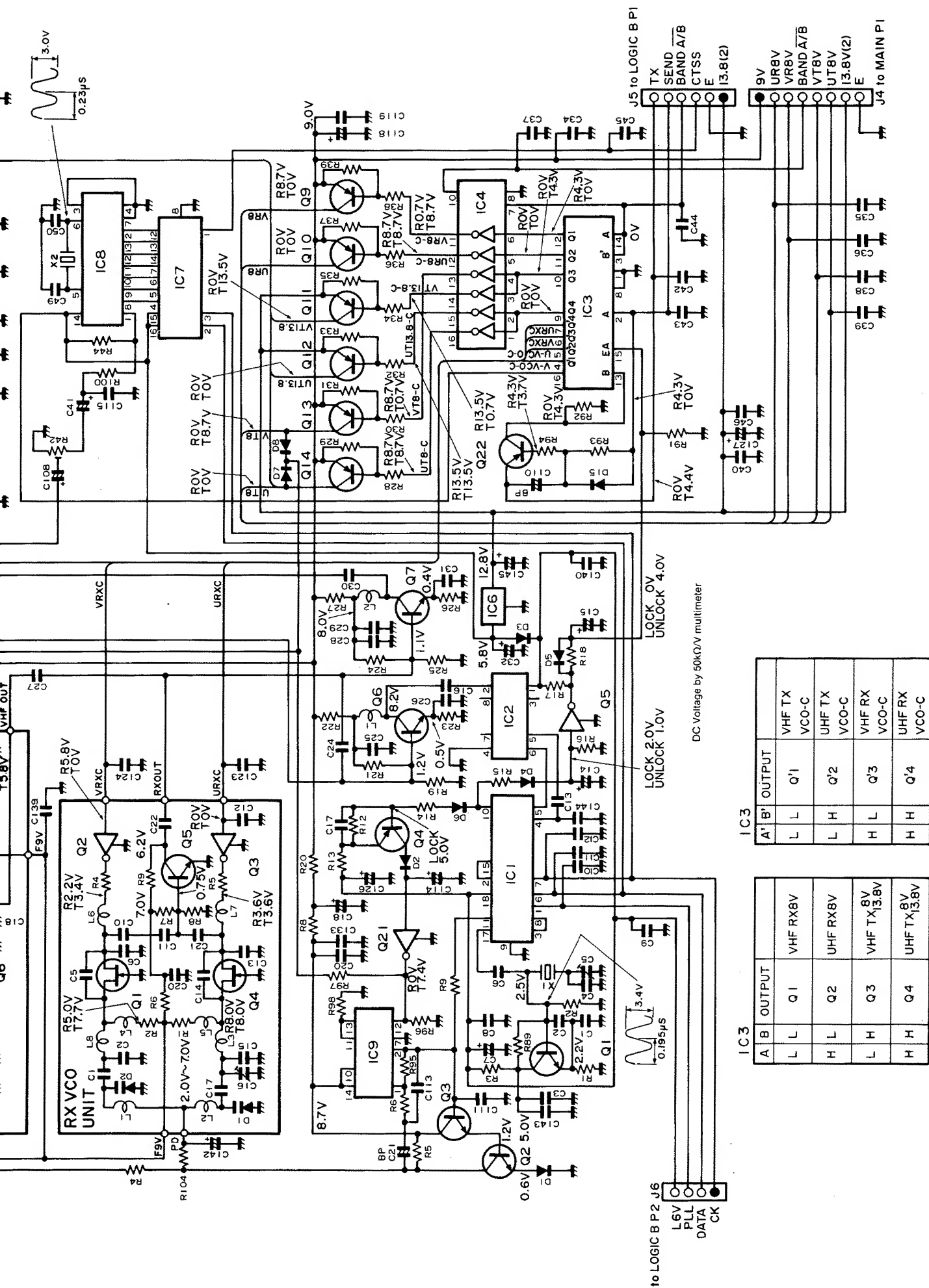
IC3

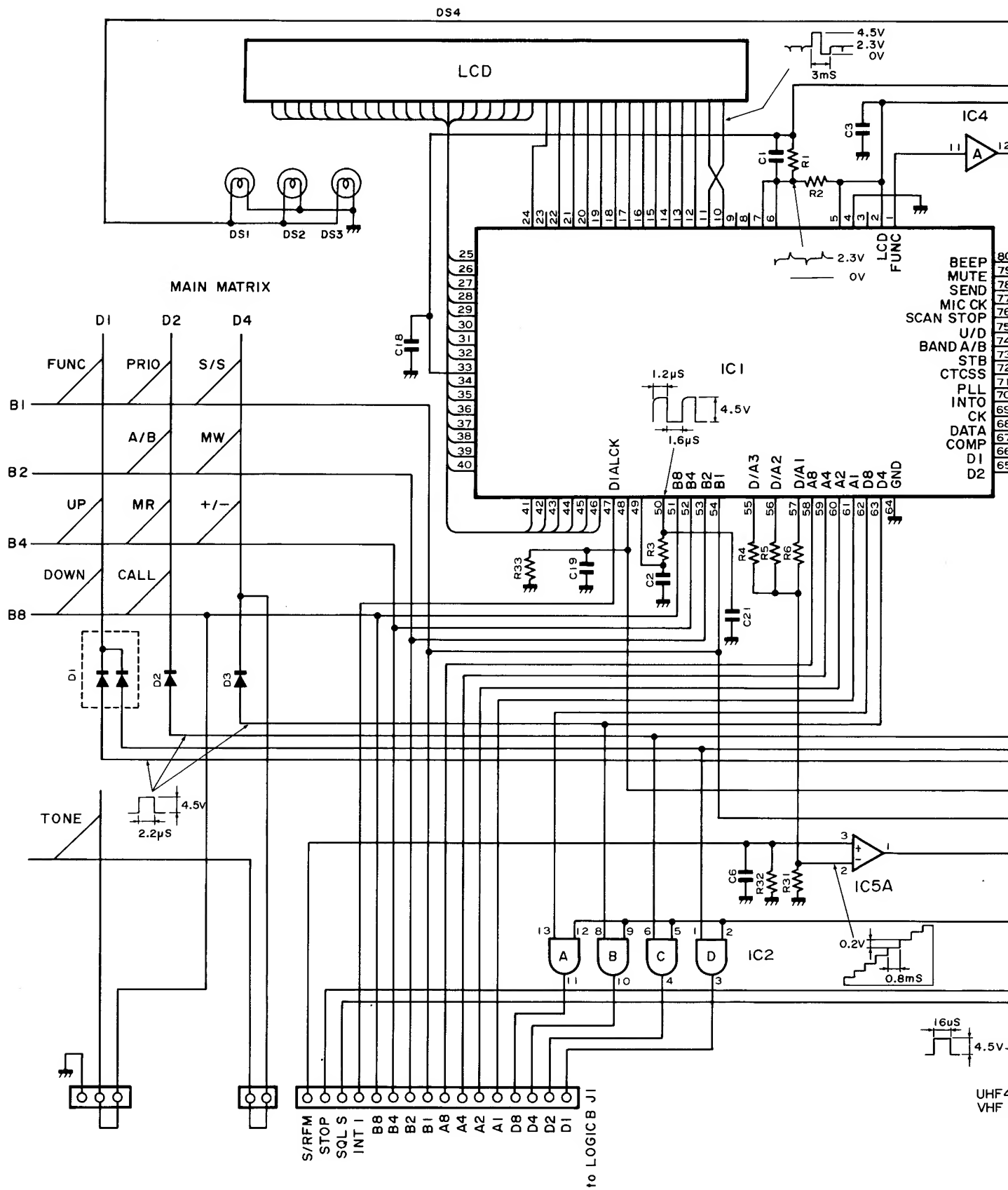
| A' B' OUTPUT | VHF TX | VHF RX | VCO-C |
|--------------|--------|--------|-------|
| L L | Q'1 | Q'2 | Q'3 |
| L H | Q'1 | Q'2 | Q'3 |
| H L | Q'1 | Q'2 | Q'3 |
| H H | Q'1 | Q'2 | Q'3 |

IC3

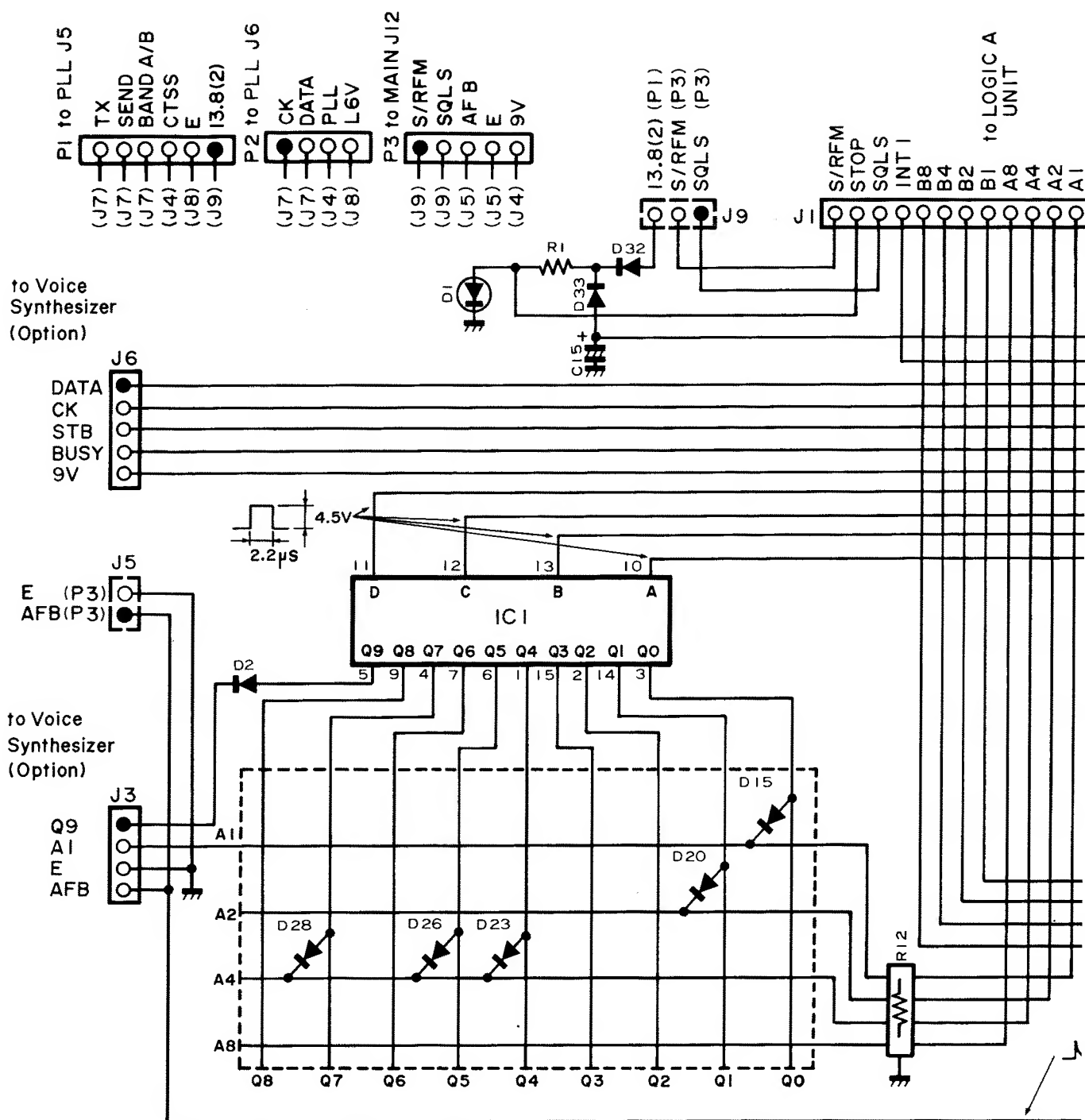
| A B OUTPUT | VHF RX8V | UHF RX8V | VHF TX13.8V | UHF TX13.8V |
|------------|----------|----------|-------------|-------------|
| L L | Q1 | Q2 | Q3 | Q4 |
| L H | Q1 | Q2 | Q3 | Q4 |
| H L | Q1 | Q2 | Q3 | Q4 |
| H H | Q1 | Q2 | Q3 | Q4 |

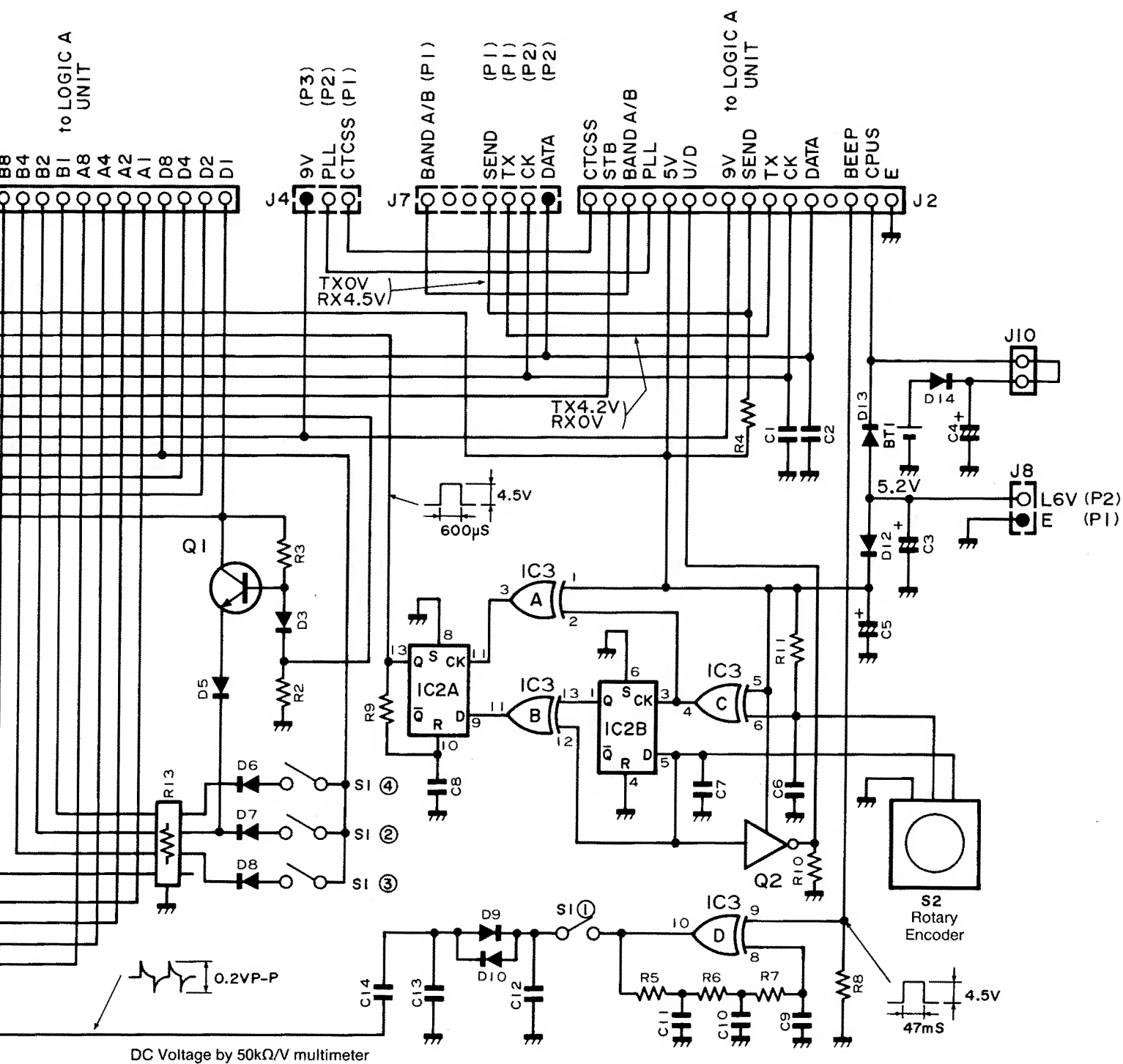




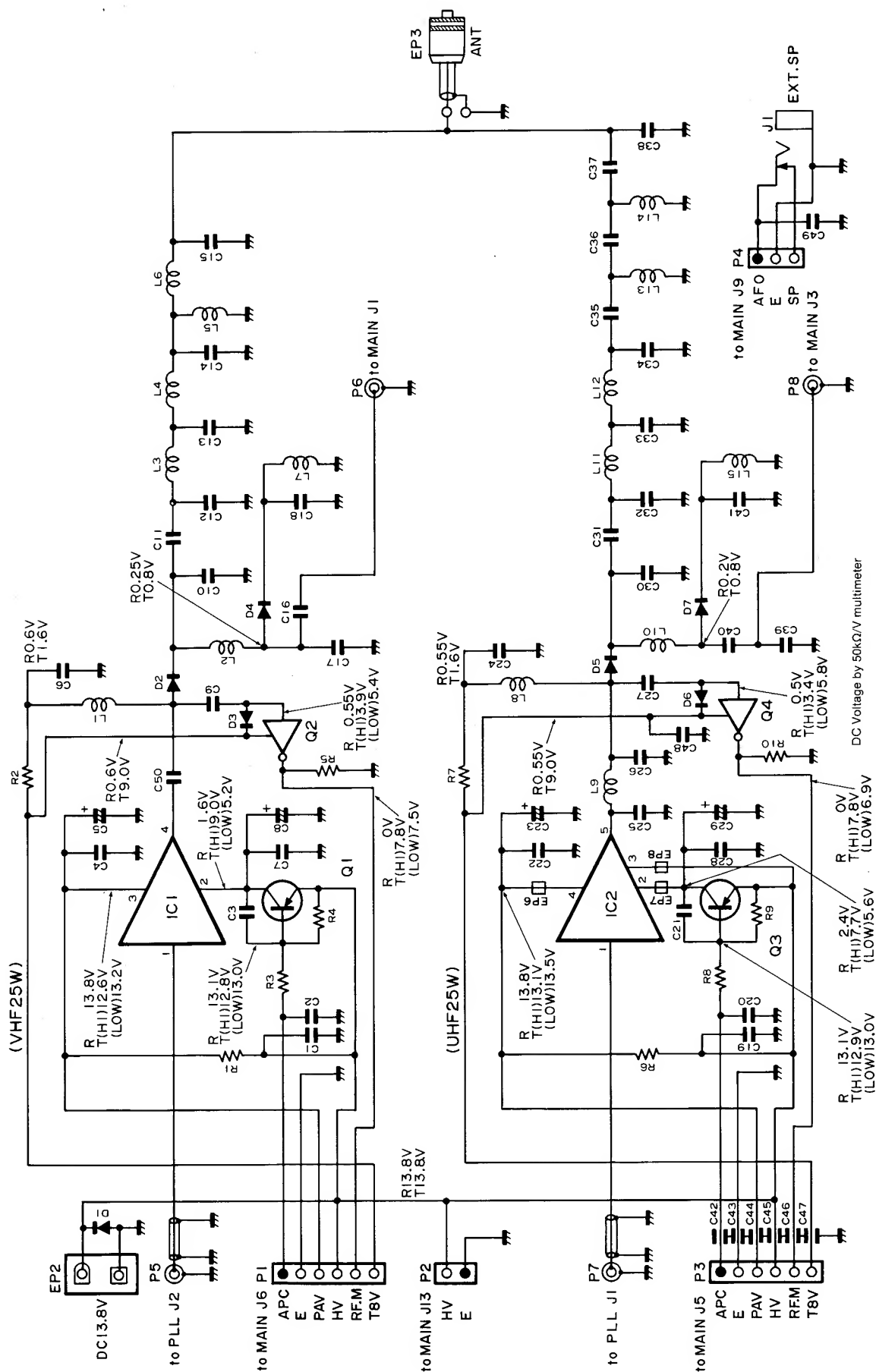


4 - 8 LOGIC B UNIT





4 - 9 PA (UHF, VHF) UNITS

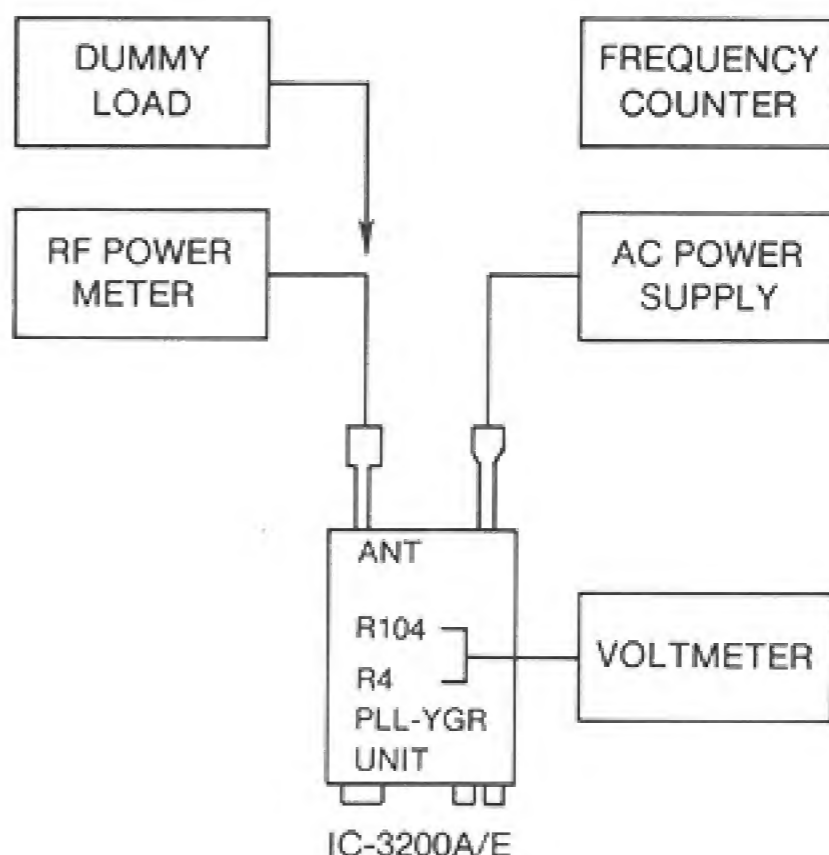


SECTION 5 MAINTENANCE AND ADJUSTMENT

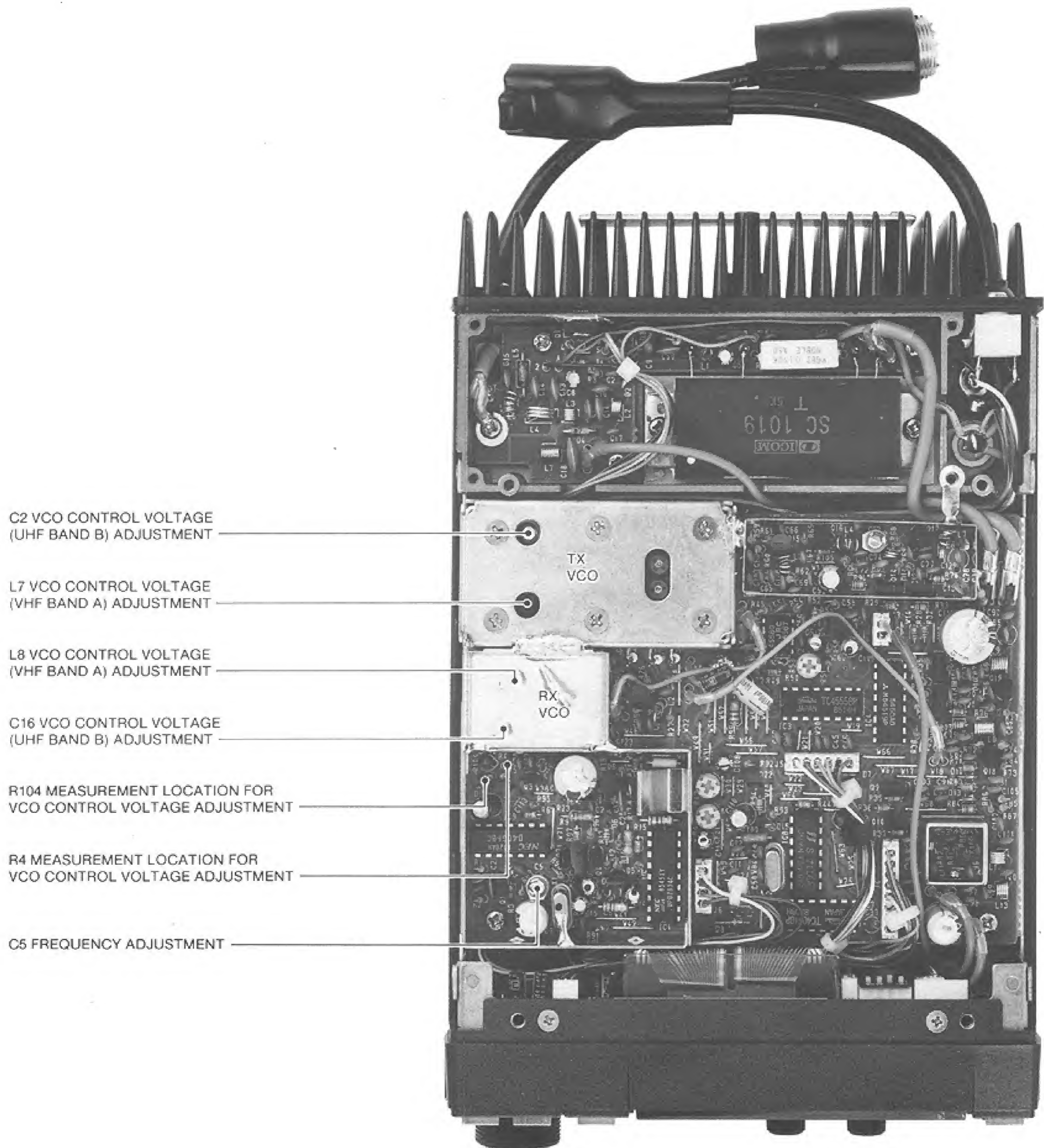
5 - 1 PREPARATION BEFORE SERVICING

1. Detach the power cord and turn OFF the VOLUME/POWER CONTROL before performing any work on the transceiver.
2. Do not short circuit components while making adjustments.
3. Use an insulated tuning tool for all adjustments.
4. Do not force any of the variable components. Tune them slowly and smoothly.
5. Follow the instructions exactly. If an indicated result is not obtained, repeat the instruction until the correct result is obtained.
6. Check the condition of connectors, solder joints and screws when adjustments are complete. Confirm that components do not touch each other.
7. Confirm defective operation of the transceiver first when checking an out-of-service unit. Verify that external sources do not cause the problem.
8. Use the correct tools and test equipment.
9. Remove the transceiver case as shown in SECTION 8-1.
10. Attach a 13.8 volt DC external power source to the power supply connector. Be sure to check the polarity.
11. For transmission problems, attach a dummy load to the antenna connector. For reception problems, attach an antenna or signal generator to the antenna connector. Do not transmit into the signal generator.
12. Recheck for the suspected malfunction with the VOLUME/POWER CONTROL ON.
13. Check the defective circuit. Measure the DC voltages of the collector, base and emitter of each transistor.

5 - 2 PLL ADJUSTMENT


| TEST INSTRUMENTS REQUIRED | | MEASUREMENT CONNECTION LOCATION | | | | |
|--|---|--|---|-------------|------------------|--------|
| <div>(1) VOLTAGE REGULATED POWER SUPPLY<ul style="list-style-type: none">• Output voltage : 13.8V DC ±15%• Current capacity : 10A or more</div> <div>(2) FREQUENCY COUNTER<ul style="list-style-type: none">• Frequency minimum : 0.1 ~ 470MHz• Frequency accuracy : 1ppm or better• Sensitivity : 100mV or better</div> <div>(3) VOLTMETER<ul style="list-style-type: none">• Input impedance : 50kΩ/V DC or better</div> <div>(4) RF POWER METER<ul style="list-style-type: none">• Terminated type• Minimum power rating : 150W• Frequency minimum : 30MHz• Input impedance : 50Ω• SWR : 1:1.2 or better</div> | |  | | | | |
| ADJUSTMENT | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
| | | UNIT | LOCATION | | UNIT | ADJUST |
| VCO CONTROL VOLTAGE ① VHF BAND (BAND A) IC-3200A (USA) | 1 <ul style="list-style-type: none">• Frequency display: 144.00MHz• Receive mode | PLL | Connect a voltmeter to R104. | 2.0V | RX VCO (PLL) | L8 |
| | 2 <ul style="list-style-type: none">• Frequency display: 144.00MHz• Transmit mode | | Connect a voltmeter to R4. | 2.5V | TX VCO (PLL) | L7 |
| | ② UHF BAND (BAND B) IC-3200A (USA) | | Connect a voltmeter to R104. | 2.0V | RX VCO (PLL) | C16 |
| | | | Connect a voltmeter to R4. | 2.0V | TX VCO | C2 |
| | ③ VHF BAND (BAND A) IC-3200A(VK) IC-3200E | | Connect a voltmeter to R104. | 2.0V | RX VCO | L8 |
| | | | Connect a voltmeter to R4. | 2.5V | TX VCO | L7 |
| | ④ UHF BAND (BAND B) IC-3200A(VK) IC-3200E | | Connect a voltmeter to R104. | 2.0V | RX VCO | C16 |
| | | | Connect a voltmeter to R4. | 2.0V | TX VCO | C2 |
| FREQUENCY ① IC-3200A (USA) | 1 <ul style="list-style-type: none">• Frequency display: 450.00MHz• Connect a dummy load to ANTENNA CONNECTOR.• Transmit mode | PLL | Make a loose coupling between a frequency counter and the dummy load. | 450.0000MHz | PLL | C5 |
| | ② IC-3200A (VK) | | | 440.0000MHz | | |
| | 1 <ul style="list-style-type: none">• Frequency display: 440.00MHz• Connect a dummy load to ANTENNA CONNECTOR.• Transmit mode | | | | | |

PLL-YGR UNIT



5 - 3 RECEIVER ADJUSTMENT

| TEST INSTRUMENTS REQUIRED | | MEASUREMENT CONNECTION LOCATION | | | | | |
|--|---|---|-----------------------|---|-----------------|------------------|-------------------|
| (1) VOLTAGE REGULATED POWER SUPPLY • Output voltage : 13.8V DC ±15% • Current capacity : 10A or more (2) VOLTMETER • Input impedance : 50kΩ/V DC or better (3) SINAD METER (4) RF SIGNAL GENERATOR • Frequency range : 0.1 ~ 30 MHz • Output level : 0.1μV ~ 100mV (5) EXTERNAL SPEAKER • Impedance : 8Ω | | <p>The diagram illustrates the setup for testing the IC-3200A/E. It shows an AC POWER SUPPLY connected to the MAIN UNIT. A SINAD METER is connected to the TO EXTERNAL SPEAKER JACK. A VOLTMETER is connected to point W23. An RF SIGNAL GENERATOR is connected to the ANTENNA (ANT.) connector. An external speaker (SP) is also connected to the ANTENNA connector.</p> | | | | | |
| ADJUSTMENT | | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
| | | | UNIT | LOCATION | | UNIT | ADJUST |
| TOTAL GAIN | 1 | <ul style="list-style-type: none"> Frequency display IC-3200A: 146.10MHz IC-3200E: 145.10MHz SQUELCH CONTROL: Maximum CCW Apply RF signal to ANTENNA CONNECTOR. Level: 32μV (-77dBm) Dev.: ±5kHz Mod.: 1kHz | MAIN | Connect a voltmeter to cathode of D9. | Maximum level | MAIN | L6 L20 |
| (B) UHF BAND | 1 | <ul style="list-style-type: none"> Frequency display IC-3200A: 445.10MHz IC-3200E: 435.10MHz SQUELCH CONTROL: Maximum CCW Apply RF signal to ANTENNA CONNECTOR. Level: 32μV (-77dBm) Dev.: ±5kHz Mod.: 1kHz | | | | | L13 C21 C36 |
| (C) UHF BAND | 1 | Adjustment conditions are same as above. | EXTERNAL SPEAKER JACK | Connect a SINAD meter to the EXTERNAL SPEAKER JACK. | Less than -12dB | | L8 L9 |
| NOTE: An RF helical cavity consisting of L1 ~ L5 for the VHF BAND or L13 and L15 for the UHF BAND has been thoroughly pre-adjusted at the factory. If you need to have this component adjusted or re-adjusted, please contact any authorized ICOM dealer or ICOM Service Center since making this adjustment requires a sweep generator. | | | | | | | |

| ADJUSTMENT | | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
|-----------------------------|--------------|--|-------------|---|-------------------------------|------------------|--------|
| | | | UNIT | LOCATION | | UNIT | ADJUST |
| S-LEVEL METER ⑤ VHF BAND | 1 | <ul style="list-style-type: none"> Frequency display IC-3200A: 146.10MHz IC-3200E: 145.10MHz SQUELCH CONTROL: Maximum CCW Apply RF signal to ANTENNA CONNECTOR. Level: 1μV (−107dBm) Dev.: \pm5kHz Mod.: 1kHz | DISPLAY |  <p>2 bars Either VFO A or M appears</p> | 2 bars appear on the DISPLAY. | MAIN | R82 |
| | ⑥ UHF BAND 1 | <ul style="list-style-type: none"> Frequency display IC-3200A: 445.10MHz IC-3200E: 435.10MHz SQUELCH CONTROL: Maximum CCW Apply RF signal to ANTENNA CONNECTOR. Level: 1μV (−107dBm) Dev.: \pm5kHz Mod.: 1kHz | | | | | R49 |

MAIN UNIT

D9 (CATHODE) MEASUREMENT LOCATION FOR TOTAL GAIN ADJUSTMENT

L20 TOTAL GAIN (VHF BAND) ADJUSTMENT

C21 TOTAL GAIN (UHF BAND) ADJUSTMENT

L13 TOTAL GAIN (UHF BAND) ADJUSTMENT

R49 S-LEVEL METER (UHF BAND) ADJUSTMENT

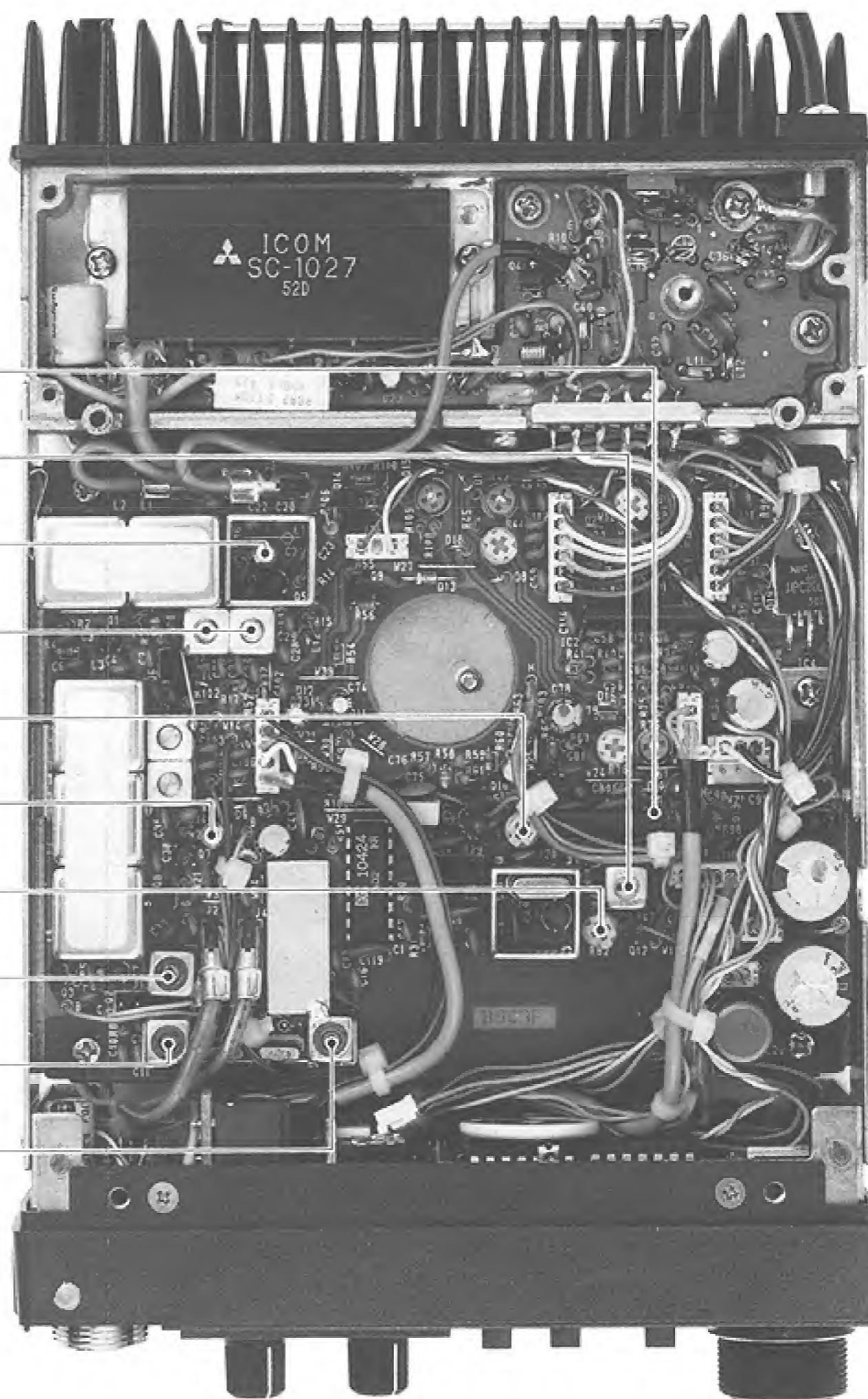
C36 TOTAL GAIN (UHF BAND) ADJUSTMENT

R82 S-LEVEL METER (VHF BAND) ADJUSTMENT

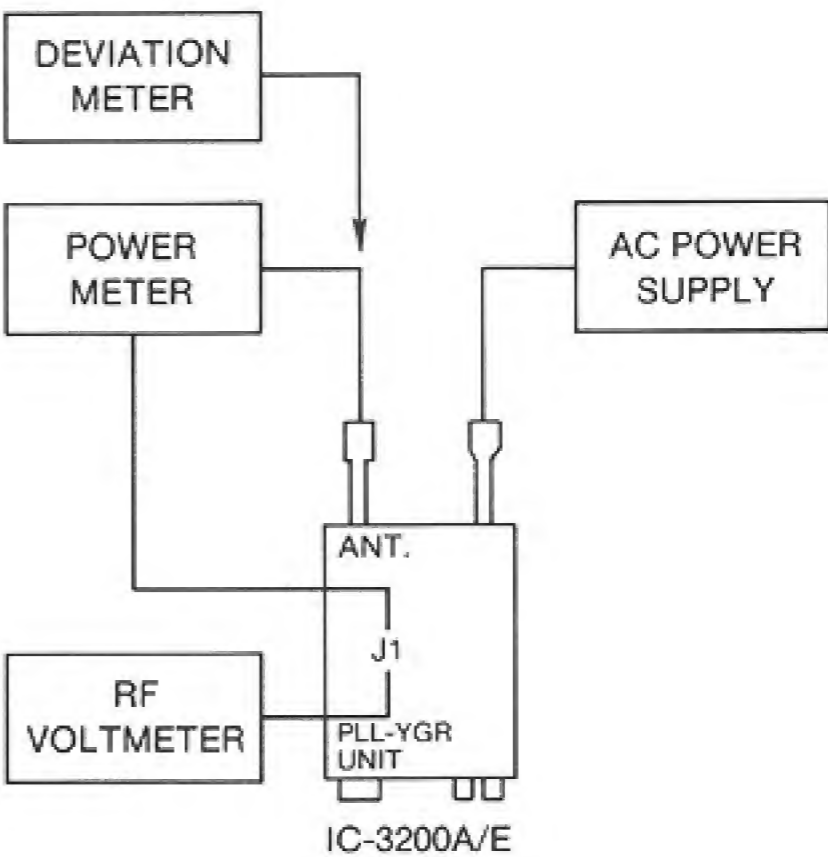

L6 TOTAL GAIN (VHF BAND) ADJUSTMENT

L8 TOTAL GAIN (UHF BAND) ADJUSTMENT

L9 TOTAL GAIN (UHF BAND) ADJUSTMENT

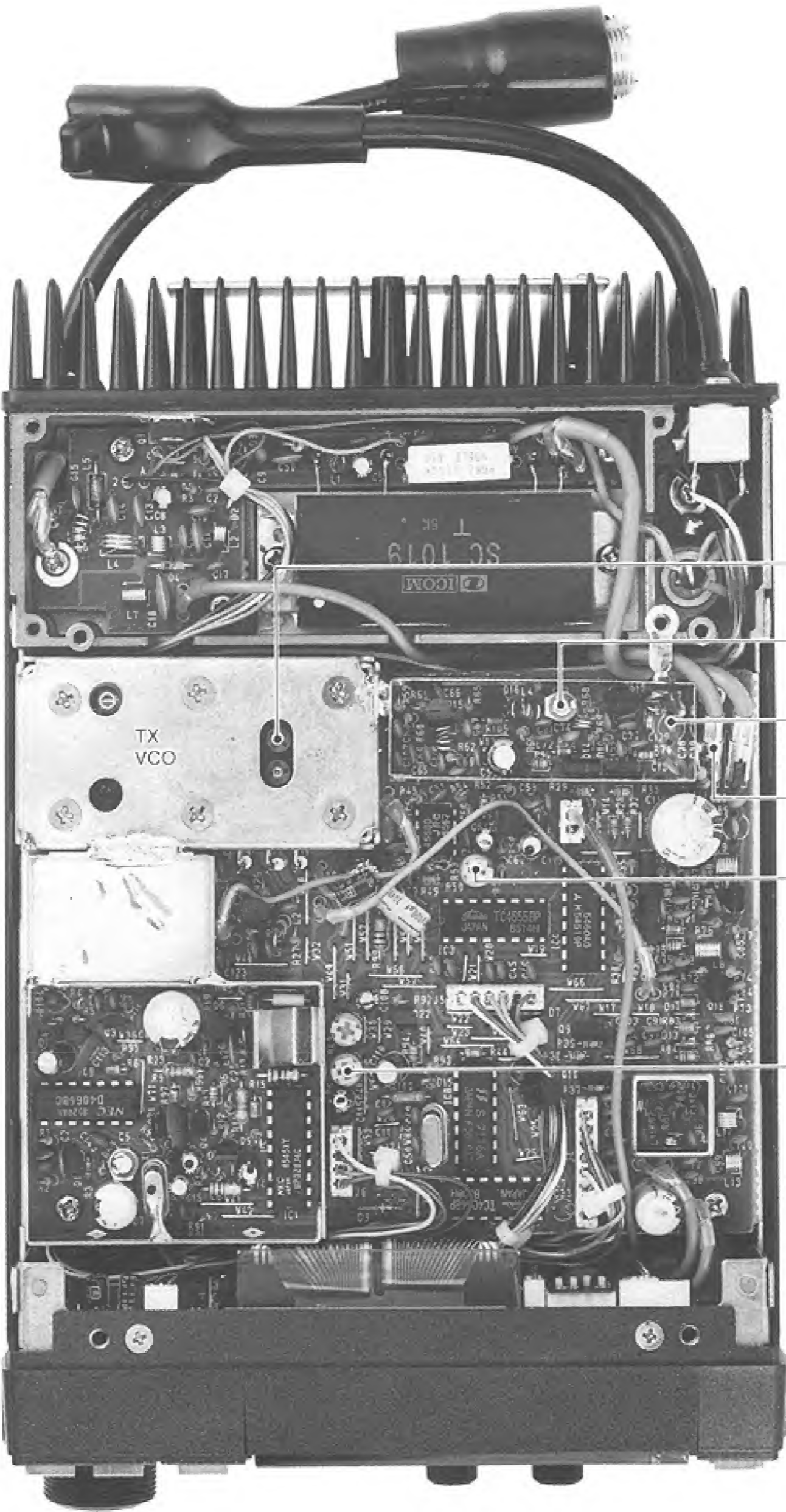


5 - 4 TRANSMITTER (UHF BAND) ADJUSTMENT

| TEST INSTRUMENTS REQUIRED | | MEASUREMENT CONNECTION LOCATION | | | | | |
|---|---|---|-------------------|---|---|------------------|------------|
| (1) VOLTAGE REGULATED POWER SUPPLY <ul style="list-style-type: none"> • Output voltage : 13.8V DC \pm15% • Current capacity : 10A or more (2) POWER METER <ul style="list-style-type: none"> • Terminated type • Minimum power rating : 150W • Frequency minimum : 30MHz • Input impedance : 50Ω • SWR : 1:1.2 or better (3) RF VOLTMETER <ul style="list-style-type: none"> • Frequency minimum : 80MHz • Measuring range : 0.01V ~ 10V (4) DEVIATION METER <ul style="list-style-type: none"> • Frequency minimum : 30MHz • Measuring range : 0 ~ \pm5kHz • De-emphasis : OFF | |  | | | | | |
| ADJUSTMENT | | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
| | | | UNIT | LOCATION | | UNIT | ADJUST |
| OUTPUT POWER | 1 | <ul style="list-style-type: none"> • Frequency display IC-3200A: 445.00MHz IC-3200E: 435.00MHz • Output power: HIGH • R42 (MAIN UNIT): Maximum CW • Transmit mode | PLL | Unplug P7 from J1 and connect a power meter or an RF voltmeter to J1. | Maximum output level. The output level should be more than 200mW or +23dBm. | PLL | C73 C78 |
| ALC | 2 | • Output power: HIGH | ANTENNA CONNECTOR | Connect a power meter to ANTENNA CONNECTOR. | 25W | MAIN | R42 |
| | 3 | • Output power: LOW | | | 5W | | R44 |
| RF LEVEL INDICATOR | 1 | <ul style="list-style-type: none"> • Frequency display IC-3200A: 445.00MHz IC-3200E: 435.00MHz • Output power: LOW • Transmit mode | DISPLAY |  3 bars | Three bars appear on the DISPLAY. | MAIN | R88 |
| MODULATION ① IC-3200A VERSIONS | 1 | <ul style="list-style-type: none"> • Frequency display IC-3200A (USA) : 445.00MHz IC-3200A (VK) : 435.00MHz • TONE: OFF • Apply AF signal to MIC CONNECTOR. Level: 65mV Freq.: 1kHz • Transmit mode | ANTENNA CONNECTOR | Connect a deviation meter to ANTENNA CONNECTOR. See SECTION 3-2-2 for MIC CONNECTOR CONNECTIONS. | \pm 4.8kHz | TX VCO | R2 |

| ADJUSTMENT | | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
|---|---|---|----------------------|---|---------|------------------|--------|
| | | | UNIT | LOCATION | | UNIT | ADJUST |
| ⑥ IC-3200E VERSION | 2 | <ul style="list-style-type: none"> Reduce 20dB for the input AF signal level. Level: 6.5mV Freq.: 1kHz | | | ±3.5kHz | PLL | R50 |
| | 1 | <ul style="list-style-type: none"> Frequency display: 435.00MHz TONE: OFF Apply AF signal to MIC CONNECTOR. Level: 20mV Freq.: 1kHz Transmit mode | | | ±4.8kHz | TX VCO | R2 |
| | 2 | <ul style="list-style-type: none"> Reduce 20dB for the input AF singal level. Level: 2mV Freq.: 1kHz | | | ±3.5kHz | PLL | R50 |
| SUBAUDIBLE TONE DEVIATION ① IC-3200A VERSIONS | 1 | <ul style="list-style-type: none"> Frequency display: 445.00MHz TONE: ON TONE No.: 08 (88.5Hz) Apply no signal to MIC CONNECTOR. Transmit mode | ANTENNA CONNECTOR | Connect a deviation meter to ANTENNA CONNECTOR. | ±0.7kHz | PLL | R42 |
| ⑥ IC-3200E VERSION | 1 | <ul style="list-style-type: none"> Frequency display: 435.00MHz [TONE] SWITCH: Push Apply no signal to MIC CONNECTOR. | | | ±3.5kHz | | R42 |

PLL-YGR UNIT



R2 MODULATION AD

C73 OUTPUT POWER AC

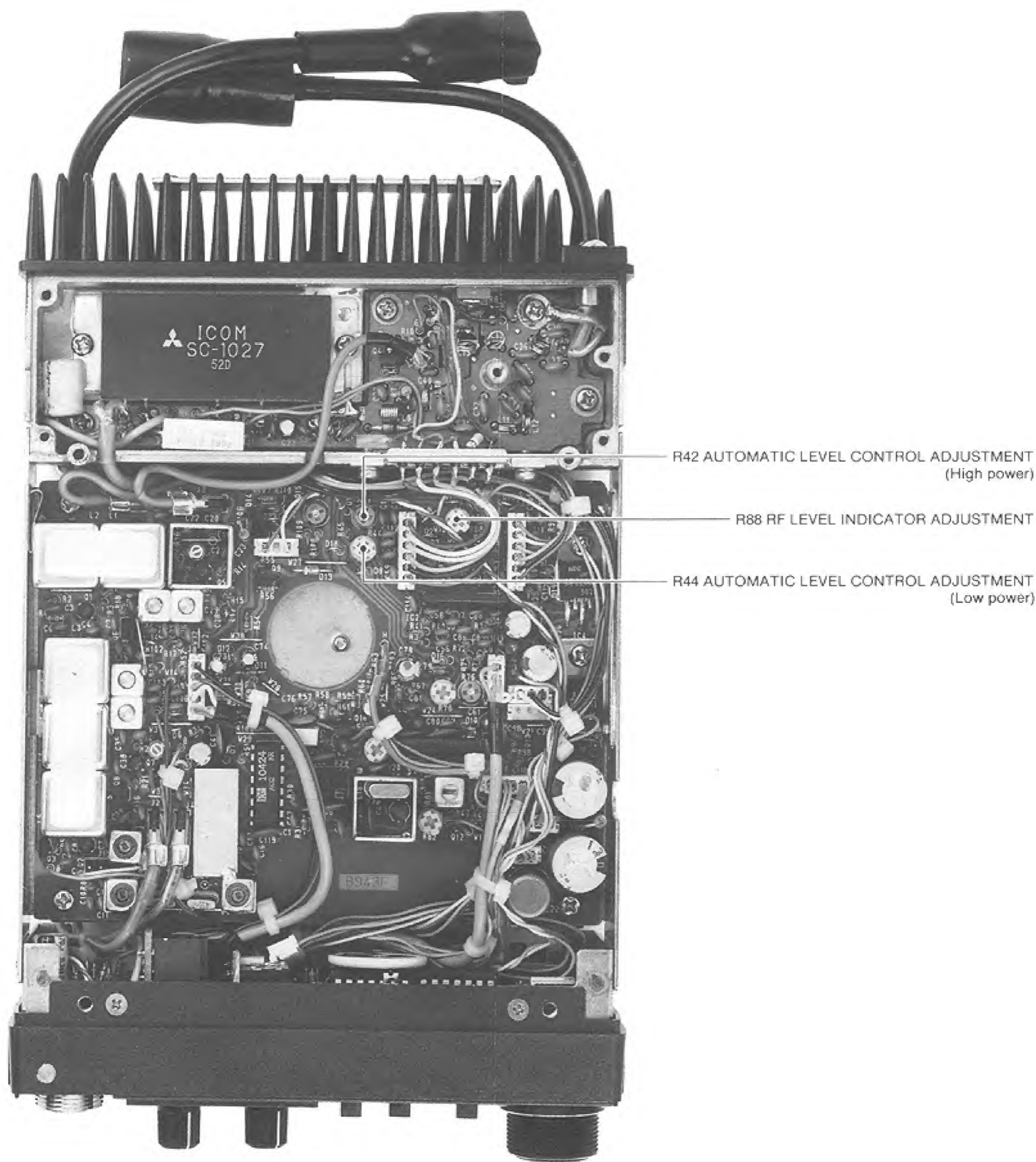
C78 OUTPUT POWER AC

J1 MEASUREMENT ADJUSTMENT
FOR OUT

R50 MODULATION AC

R42 SUBAUDIBLE TONE
AC

MAIN UNIT

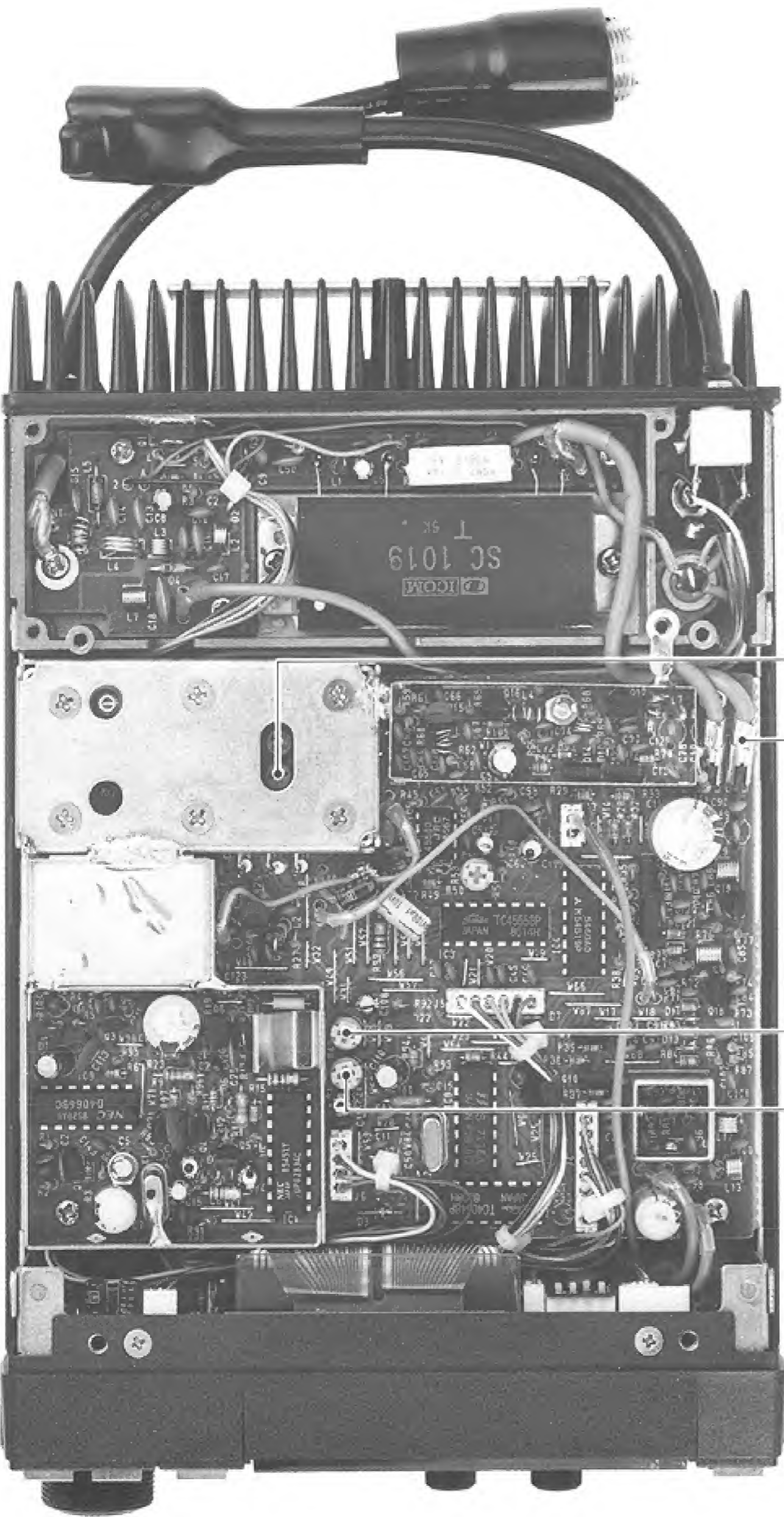


5 - 5 TRANSMITTER (VHF BAND) ADJUSTMENT

| TEST INSTRUMENTS REQUIRED | | MEASUREMENT CONNECTION LOCATION |
|---|--|---------------------------------|
| (1) VOLTAGE REGULATED POWER SUPPLY <ul style="list-style-type: none"> • Output voltage : 13.8V DC \pm15% • Current capacity : 10A or more (2) RF VOLTMETER <ul style="list-style-type: none"> • Frequency minimum : 80MHz • Measuring range : 0.01V ~ 10V (3) POWER METER <ul style="list-style-type: none"> • Terminated type • Minimum power rating : 150W • Frequency minimum : 30MHz • Input impedance : 50Ω • SWR : 1:1.2 or better (4) DEVIATION METER <ul style="list-style-type: none"> • Frequency minimum : 30MHz • Measuring range : 0 ~ \pm5kHz • De-emphasis : OFF | | |

| ADJUSTMENT | | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | | |
|---|--------------------|--|-------------------|---|--|------------------|---------|--------|
| | | | UNIT | LOCATION | | UNIT | ADJUST | |
| OUTPUT POWER | 1 | <ul style="list-style-type: none">• Frequency display IC-3200A: 146.01MHz IC-3200E: 145.00MHz• Output power: HIGH• Transmit mode | PLL | Unplug P5 from J2 and connect a power meter or RF voltmeter to J2. | More than 200mW or +23dBm | PLL | Verify | |
| ALC | 2 | <ul style="list-style-type: none">• Output power: HIGH | ANTENNA CONNECTOR | Connect a power meter to ANTENNA CONNECTOR. | 25W | MAIN | R76 | |
| | 3 | <ul style="list-style-type: none">• Output power: LOW | | | 5W | | R78 | |
| RF LEVEL INDICATOR | 1 | NOTE: No adjustment is required if this adjustment has already been made in the UHF band. Refer to SECTION 5-4 TRANSMITTER (UHF BAND) ADJUSTMENT for RF LEVEL INDICATOR instructions. | | | | | | |
| MODULATION ① IC-3200A VERSIONS | 1 | <ul style="list-style-type: none">• Frequency display: 146.00MHz• TONE: OFF• Apply AF signal to MIC CONNECTOR. Level: 65mV Freq.: 1kHz• Transmit mode | ANTENNA CONNECTOR | Connect a deviation meter to ANTENNA CONNECTOR. See SECTION 3-2-2 for MIC CONNECTOR CONNECTIONS. | ±4.8kHz | TX VCO | R3 | |
| | 2 | <ul style="list-style-type: none">• Reduce 20dB for the input AF signal level. Level: 6.5mV Freq.: 1kHz | | | ±3.5kHz | | Verify | |
| | ② IC-3200E VERSION | 1 | | | <ul style="list-style-type: none">• Frequency display: 145.00MHz• TONE: OFF• Apply AF signal to MIC CONNECTOR. Level: 20mV Freq.: 1kHz• Transmit mode | | ±4.8kHz | R3 |
| | | 2 | | | <ul style="list-style-type: none">• Reduce 20dB for the input AF signal level. Level: 2mV Freq.: 1kHz | | ±3.5kHz | Verify |
| SUBAUDIBLE TONE DEVIATION ① IC-3200A VERSION | 1 | <ul style="list-style-type: none">• Frequency display: 146.00MHz• TONE: ON• TONE No.: 08 (88.5Hz)• No signal applies to MIC CONNECTOR. | ANTENNA CONNECTOR | Connect a deviation meter to ANTENNA CONNECTOR. | ±0.7kHz | PLL | R43 | |
| | ② IC-3200E VERSION | 1 | | | <ul style="list-style-type: none">• Frequency display: 145.00MHz• [TONE] SWITCH: Push• Apply no signal to MIC CONNECTOR. | | ±3.5kHz | R42 |

PLL-YGR UNIT



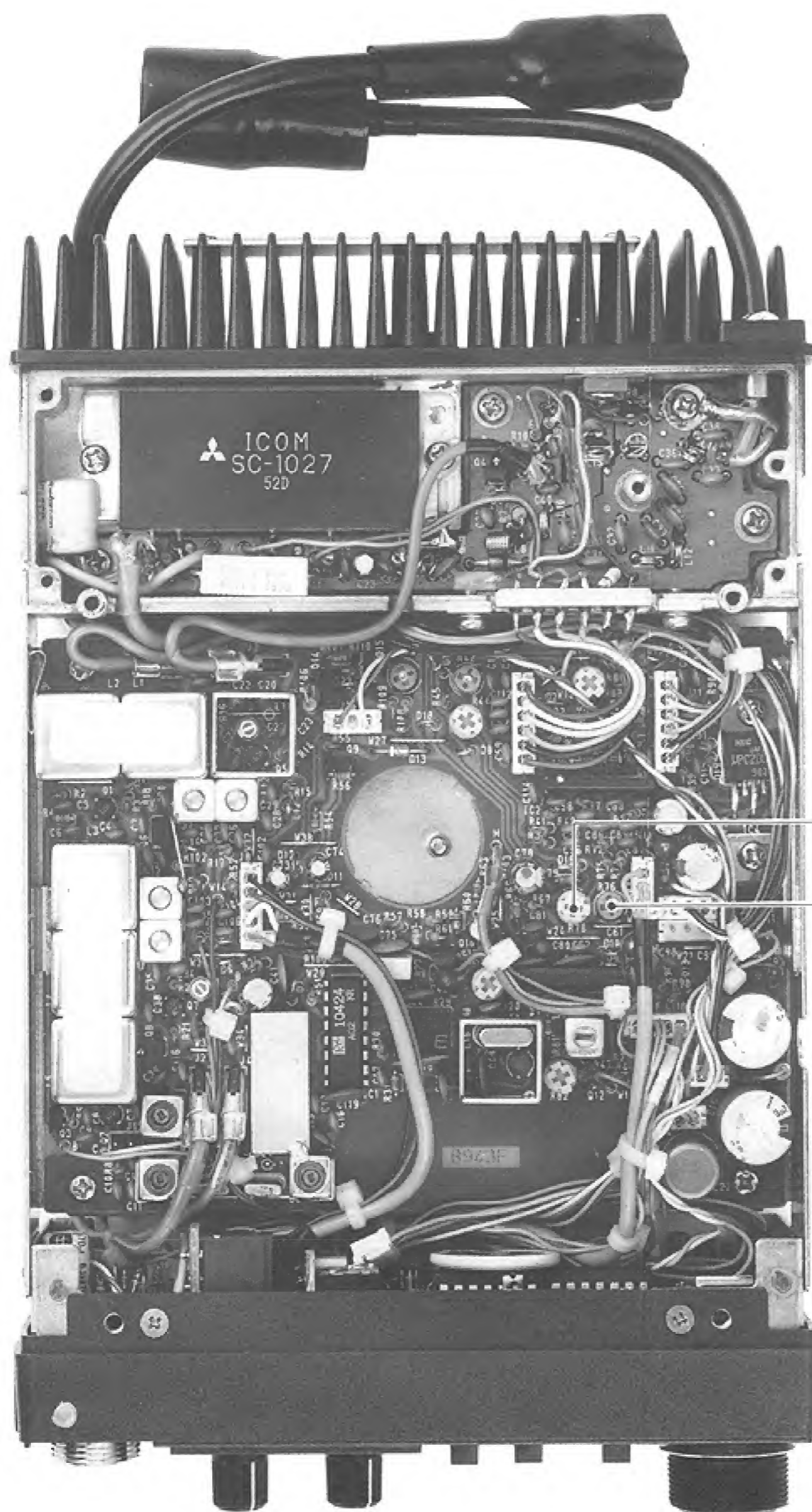
R3 MODULATION ADJUSTMENT

J2 MEASUREMENT LOCATION FOR
OUTPUT POWER ADJUSTMENT

R43 SUBAUDIBLE TONE DEVIATION
ADJUSTMENT

R42 SUBAUDIBLE TONE DEVIATION
ADJUSTMENT

MAIN UNIT



R78 AUTOMATIC LEVEL CONTROL ADJUSTMENT

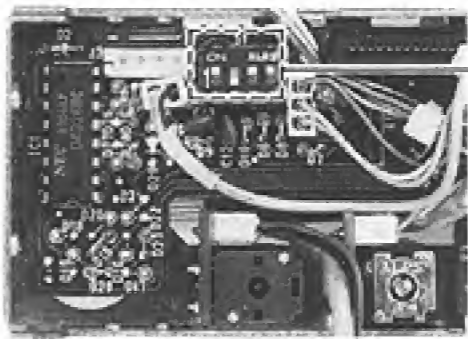
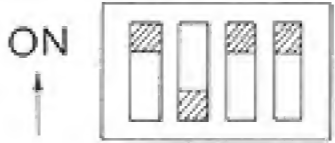
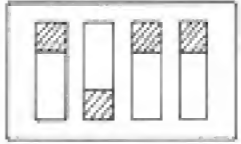
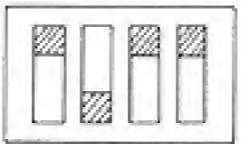
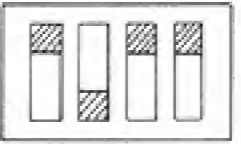
R76 AUTOMATIC LEVEL CONTROL ADJUSTMENT

SECTION 6 TROUBLESHOOTING

Your IC-3200A/E has been carefully adjusted at the factory prior to shipping. The chart below is provided to help you correct problems that are not equipment malfunctions.

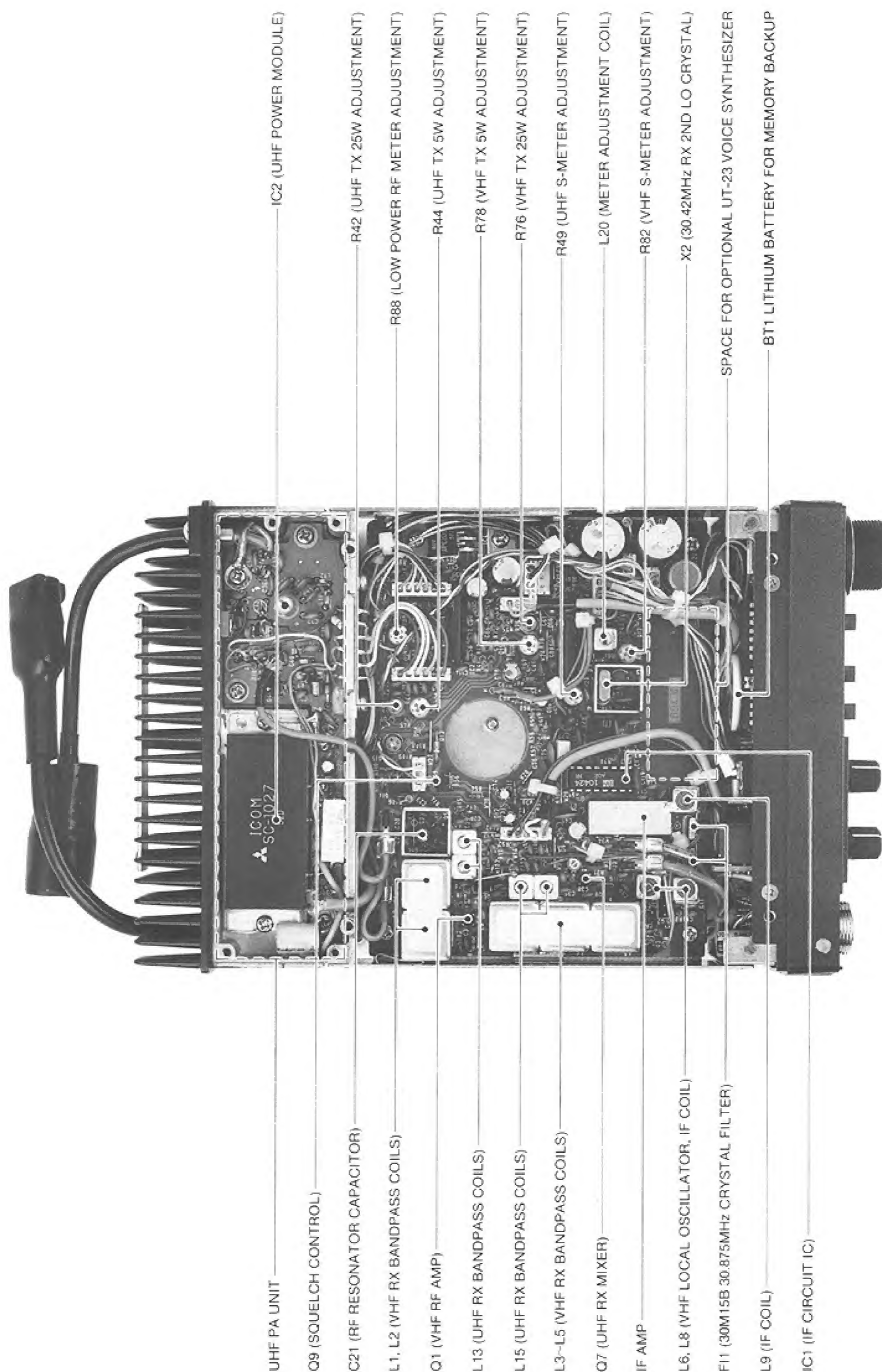
If you are unable to locate the trouble or correct the fault, please contact your dealer or the nearest authorized ICOM Service Center.

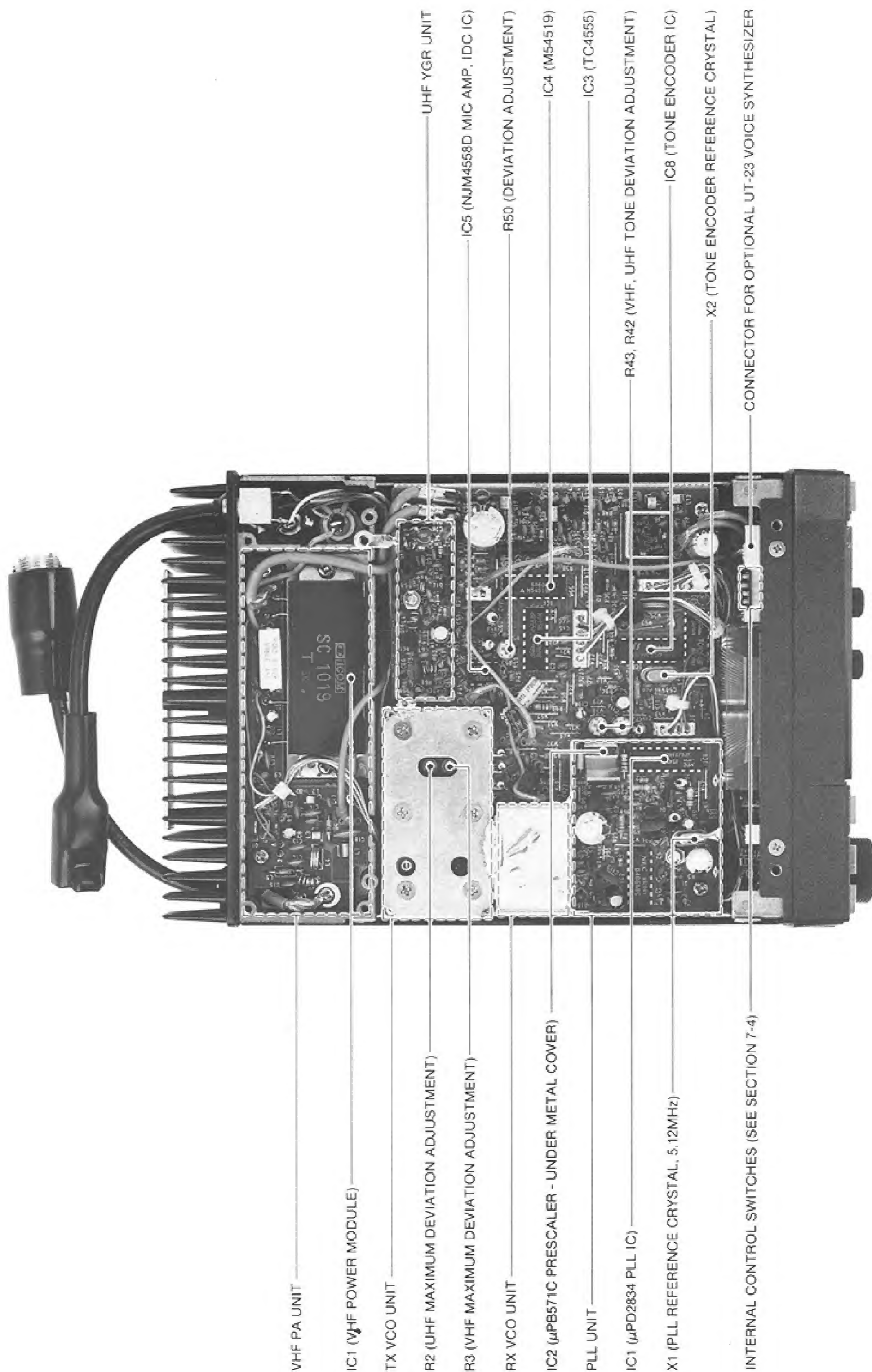
| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|--|---|--|
| 1. Power does not come on when the POWER SWITCH is pressed. | <ul style="list-style-type: none"> • Power cable is improperly connected. • Power cable is connected with the polarity reversed. • Power supply connection is impaired. • Power supply is not connected. • Blown fuse. | <ul style="list-style-type: none"> • Carefully reconnect power cable. • Disconnect the power cable, replace fuse, and reconnect the power cable observing the proper polarity. • Inspect connection pins. • Reconnect. • Check for the cause, then replace fuse with a spare one. |
| 2. No sound comes from the speaker. | <ul style="list-style-type: none"> • VOLUME CONTROL is turned completely counterclockwise but not "clicked" OFF. • SQUELCH CONTROL is operating. • Internal speaker is disconnected. • Connection cable to the optional external speaker is broken. | <ul style="list-style-type: none"> • Turn the control clockwise to a suitable level. • Turn the SQUELCH CONTROL completely counterclockwise. • Inspect and make connection. • Inspect and repair connection. |
| 3. Sensitivity is low and only strong signals are audible. | <ul style="list-style-type: none"> • The antenna feedline is cut or shorted. • Receive frequency and the receivable frequency range of the antenna are not compatible. | <ul style="list-style-type: none"> • Check the feedline and correct any improper condition. • Change antennas. |
| 4. RF output is low or non-existent. | <ul style="list-style-type: none"> • The PTT SWITCH is impaired due to a poor connection with the MIC CONNECTOR. • The antenna feedline is cut or shorted. | <ul style="list-style-type: none"> • Check MIC CONNECTOR connection. • Check the antenna feedline for problems. |
| 5. No modulation. | <ul style="list-style-type: none"> • Poor MIC CONNECTOR connection. • The MIC cable is cut. | <ul style="list-style-type: none"> • Check connections at the MIC CONNECTOR and correct any problems. • Repair disconnected or cut wires. |
| 6. Unable to contact another station even though signals are being transmitted and the receive mode function is working. | <ul style="list-style-type: none"> • The transceiver is set in DUPLEX mode (when SIMPLEX is desired) or vice versa. • An improper frequency split is programmed or input/output repeater frequencies are reversed. | <ul style="list-style-type: none"> • Press the [+/-] SWITCH to select SIMPLEX mode or press the [+/-] SWITCH to select either DUPLEX + or DUPLEX - mode. • Program the proper frequency split or press the [+/-] SWITCH to select either DUPLEX + or DUPLEX - mode according to the repeater input/output frequencies. |
| 7. MEMORY SCAN mode does not function when the SCAN SWITCH is pressed. | <ul style="list-style-type: none"> • The transceiver is not set in MEMORY SCAN mode. • All memory channels are programmed with the MEMORY SKIP function. • The SQUELCH CONTROL is open (RX INDICATOR is ON). | <ul style="list-style-type: none"> • Press the [MR] SWITCH. • Delete some of the MEMORY SKIP programming from the memory channels by pressing the [F] and [M-SKIP] SWITCHES. • Turn the SQUELCH CONTROL clockwise until the RX INDICATOR goes out. |

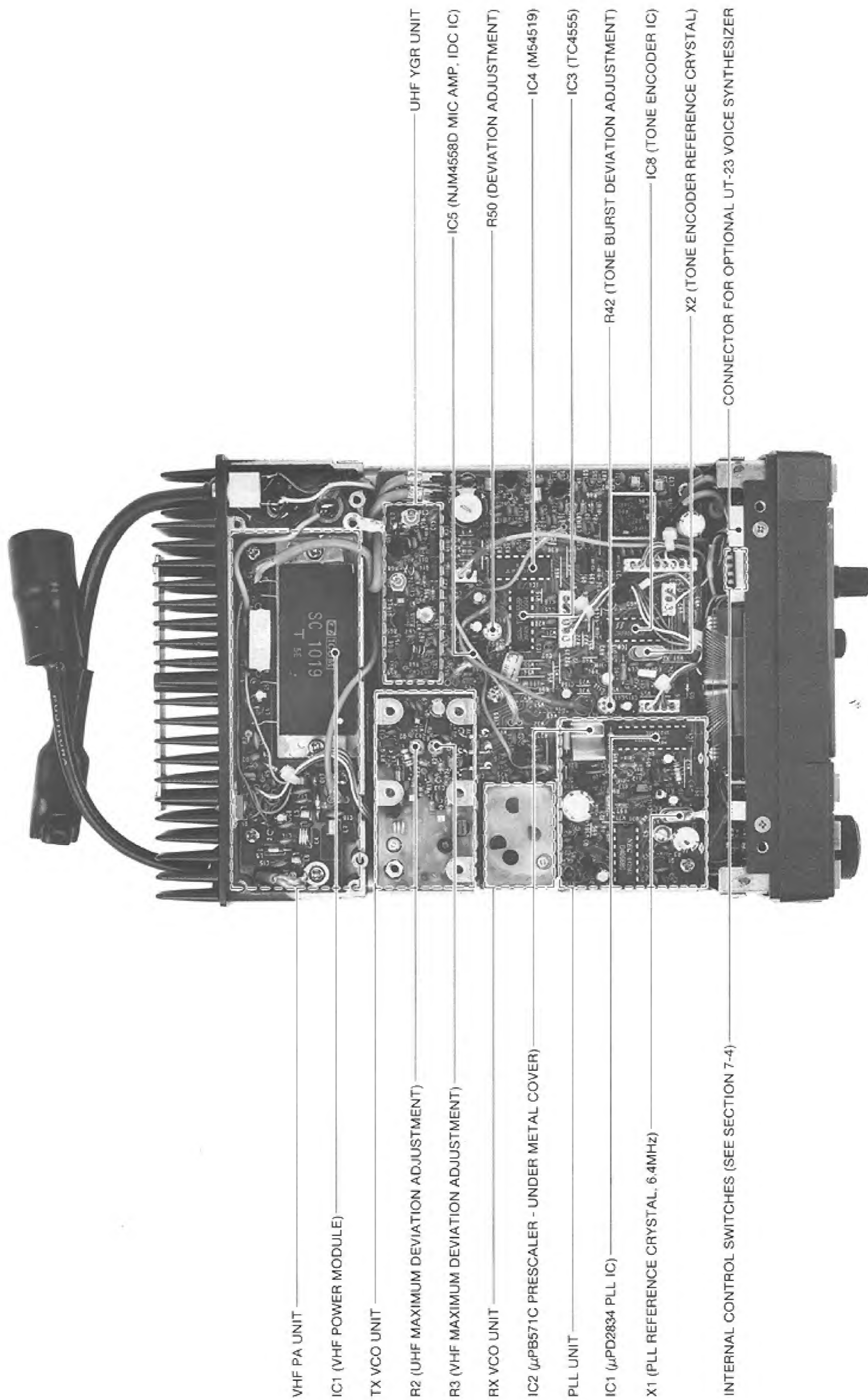
| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|--|--|--|
| 8. PROGRAMMED SCAN mode does not function when the SCAN SWITCH is pressed. | <ul style="list-style-type: none"> The transceiver is not set in the VFO mode. The SQUELCH CONTROL is open (RX INDICATOR is ON). | <ul style="list-style-type: none"> Press the [A/B] SWITCH to select the VFO mode. Turn the SQUELCH CONTROL clockwise until the RX INDICATOR goes out. |
| 9. Frequency does not change when turning the TUNING CONTROL. | <ul style="list-style-type: none"> LOCK SWITCH is engaged. | <ul style="list-style-type: none"> Press the FUNCTION [F] SWITCH and [LOCK] SWITCH to disengage the lock. |
| 10. No voice output occurs when an optional UT-23 VOICE SYNTHESIZER unit is installed. | <ul style="list-style-type: none"> ON/OFF SWITCH on the UT-23 is in the OFF position. TUNING CONTROL is being rotated. | <ul style="list-style-type: none"> Set the ON/OFF SWITCH in the ON position after installing unit. Stop the TUNING CONTROL at a receive frequency for voice output to be heard. |
| 11. No beeps are heard when pressing the [▶] or [◀] SWITCHES on the front panel. | <ul style="list-style-type: none"> The audible beep switch on the LOGIC B UNIT is in the OFF position. | <ul style="list-style-type: none"> Set switch to the ON position.  <p>Switch panel on LOGIC B UNIT</p>  <p>audible beep switch</p> |
| 12. Scanning does not begin immediately after a signal fades. | <ul style="list-style-type: none"> The scan stop interval switch on the LOGIC B UNIT is in the ON position. | <ul style="list-style-type: none"> Set switch to the OFF position.  <p>scan stop interval switch</p> |
| 13. MEMORY CHANNELS can not be recalled by turning the TUNING CONTROL. | <ul style="list-style-type: none"> The memory dial lock switch on the LOGIC B UNIT is in the OFF position. | <ul style="list-style-type: none"> Set switch to the ON position.  <p>memory dial lock switch</p> |
| 14. Scanning speed is slower or faster than that desired. | <ul style="list-style-type: none"> The scan speed switch on the LOGIC B UNIT is set in the wrong position. | <ul style="list-style-type: none"> Adjust the switch to select the desired scanning speed: fast [ON], slow [OFF].  <p>scan speed switch</p> |

SECTION 7 INSIDE VIEWS

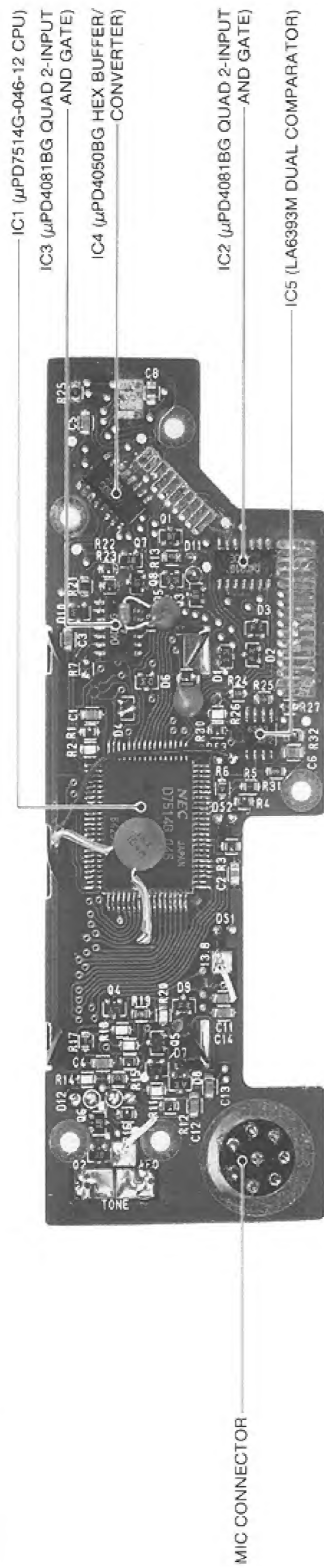
7 - 1 MAIN UNIT



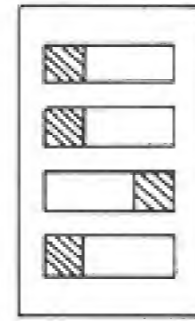




LOGIC A UNIT

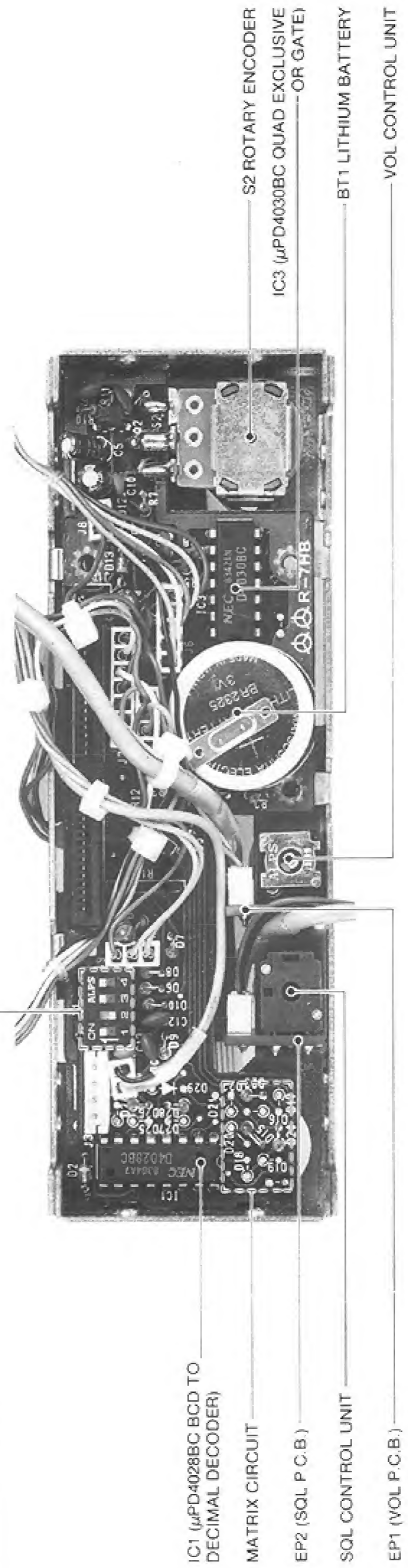


1. BEEP ON/OFF SWITCH
2. SCAN STOP INTERVAL SWITCH
3. MEMORY DIAL LOCK SWITCH
4. SCAN SPEED SWITCH



Beeps are emitted when this switch is set in the ON position.
 Scanning resumes immediately after a signal fades unless this switch is set in the ON position. With the switch ON scanning is delayed 5 seconds after the signal fades.
 Locks a memorized frequency, freezing the TUNING CONTROL, when the switch is set in the OFF position.
 Changes scanning speed from FAST to SLOW in scan modes. FAST [ON], SLOW [OFF].

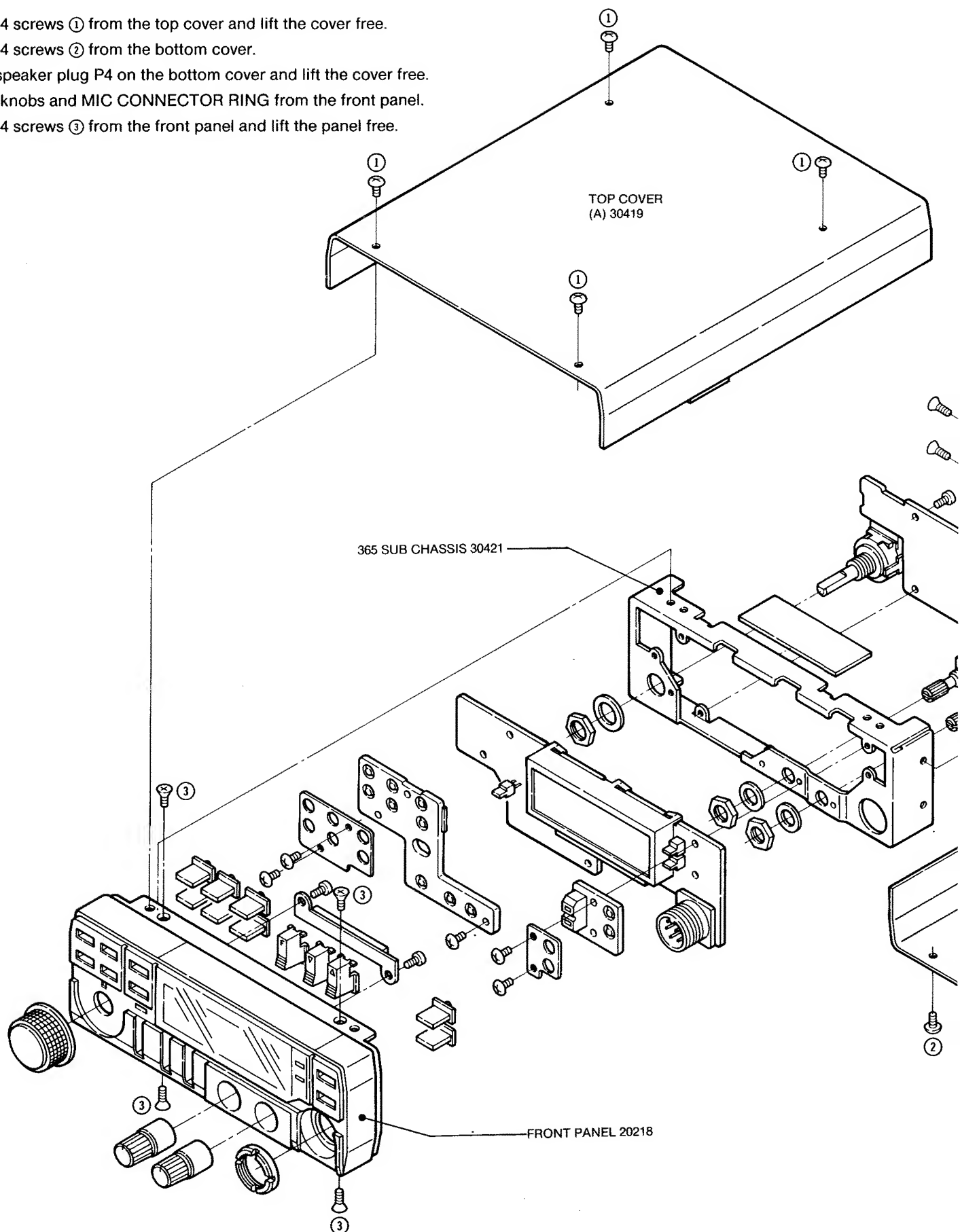
LOGIC B UNIT

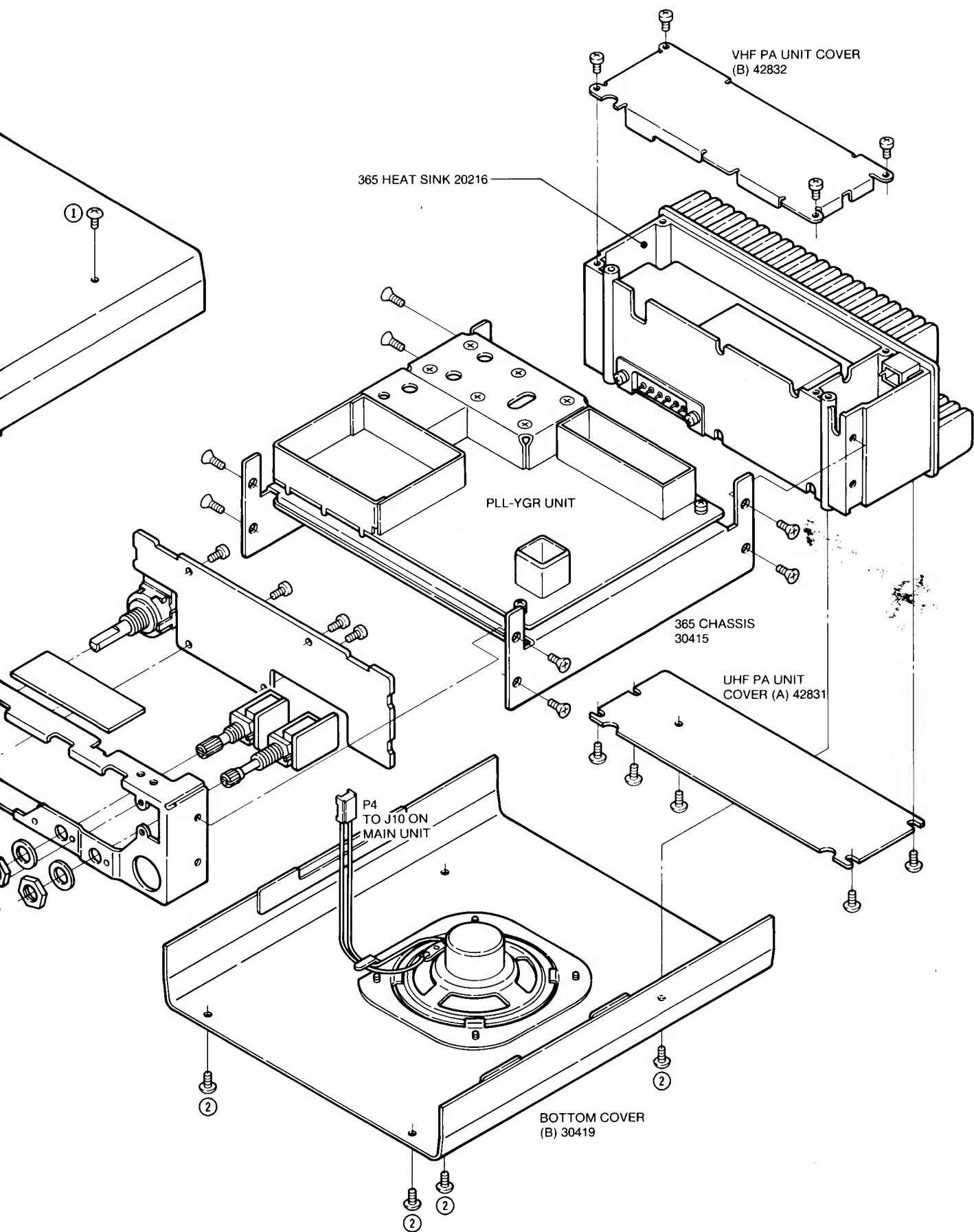


SECTION 8 DISASSEMBLY AND ASSEMBLY DIAGRAMS

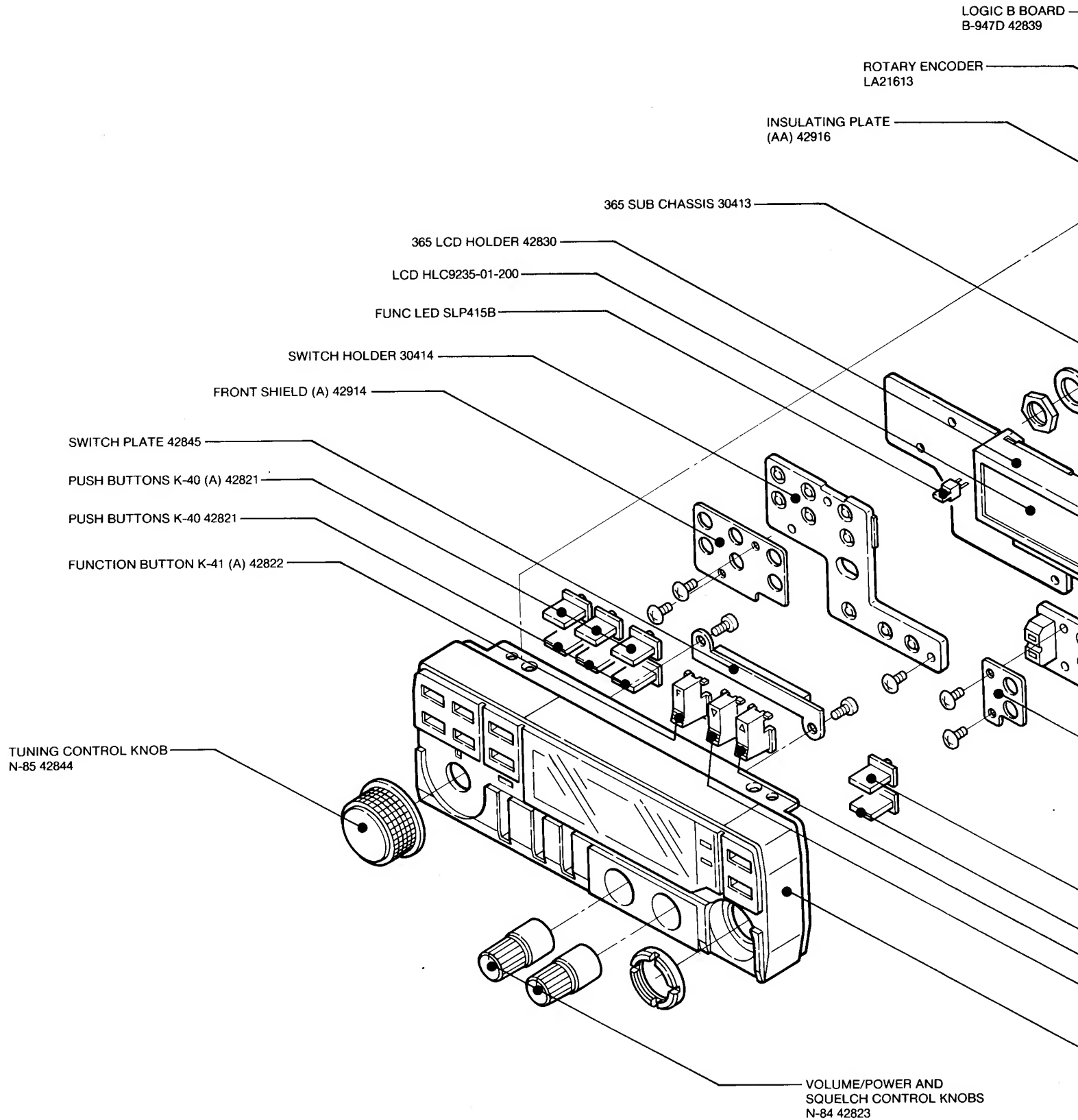
8 - 1 FRAME DISASSEMBLY

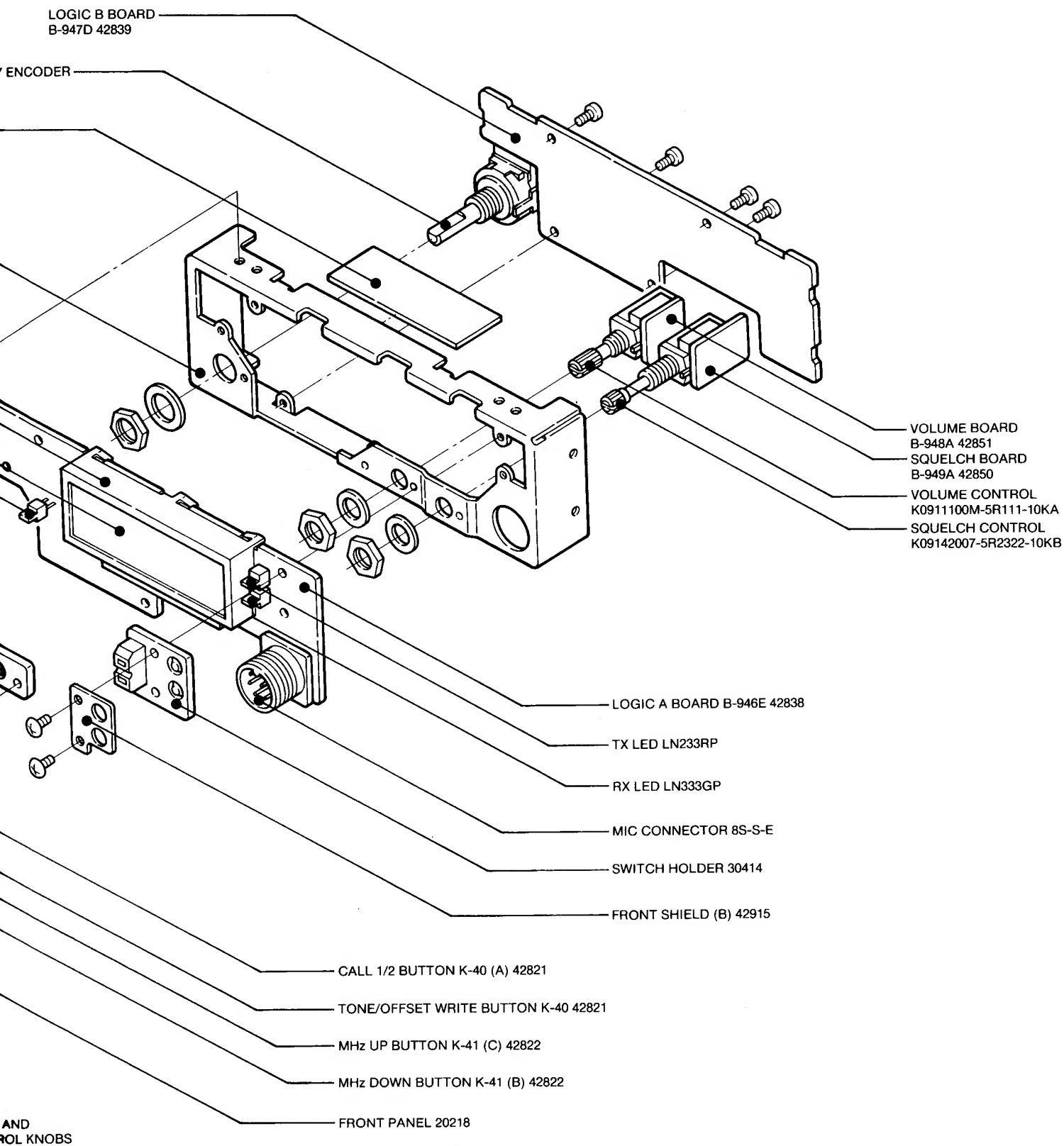
1. Remove 4 screws ① from the top cover and lift the cover free.
2. Remove 4 screws ② from the bottom cover.
3. Unplug speaker plug P4 on the bottom cover and lift the cover free.
4. Remove knobs and MIC CONNECTOR RING from the front panel.
5. Remove 4 screws ③ from the front panel and lift the panel free.



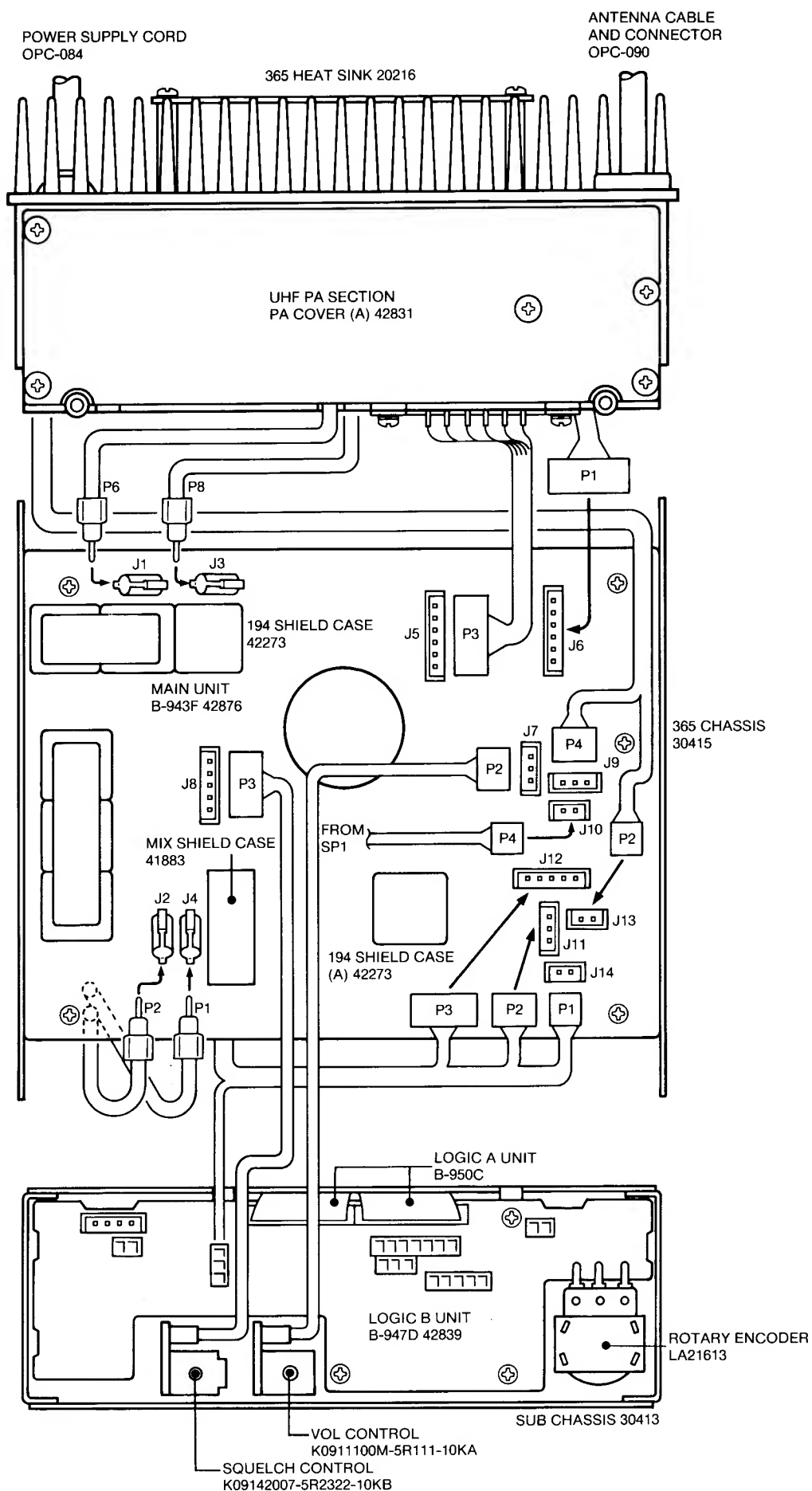


8 - 2 FRONT PANEL DISASSEMBLY

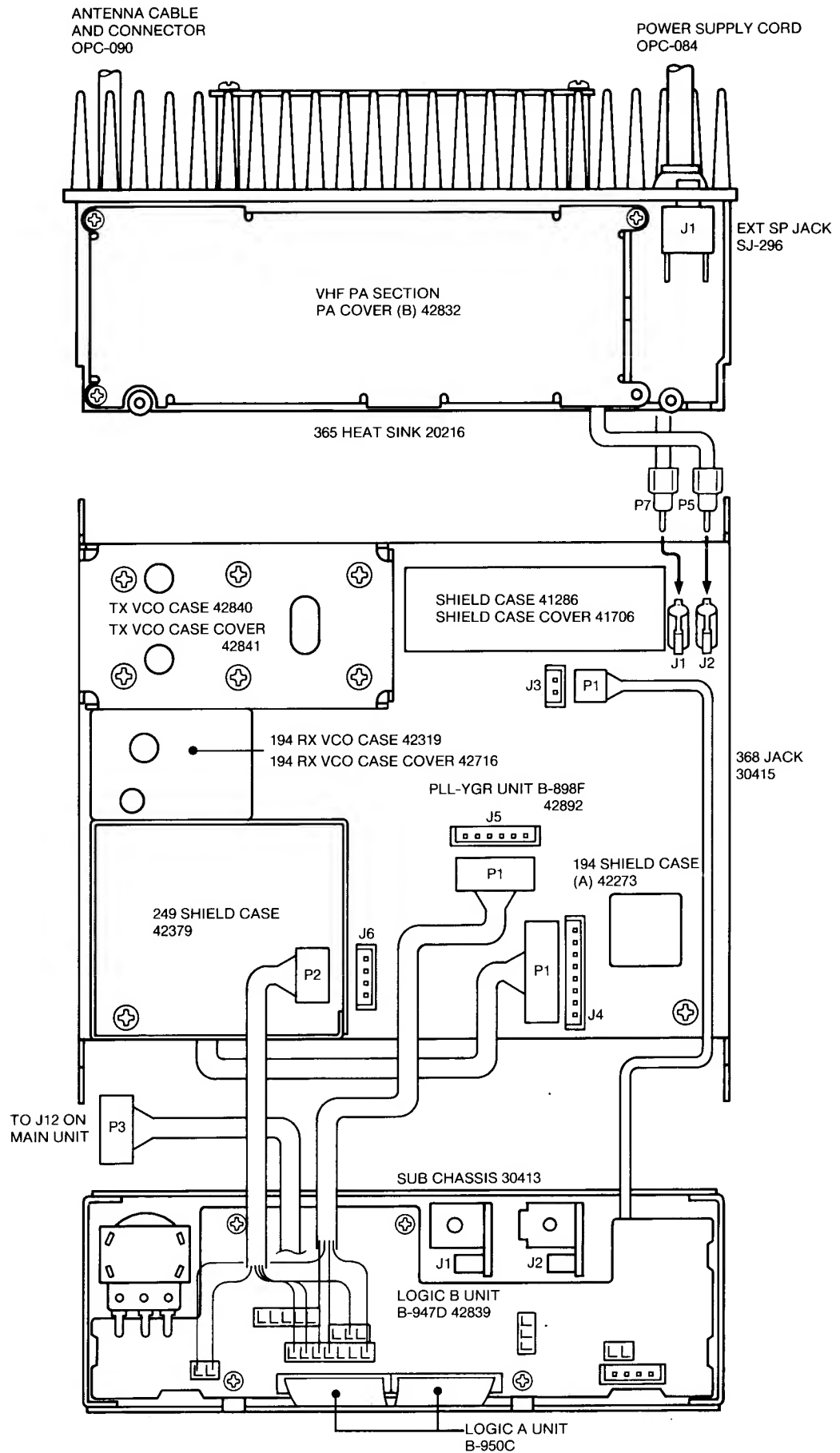




8 - 3 MAIN UNIT CONNECTOR ASSEMBLY

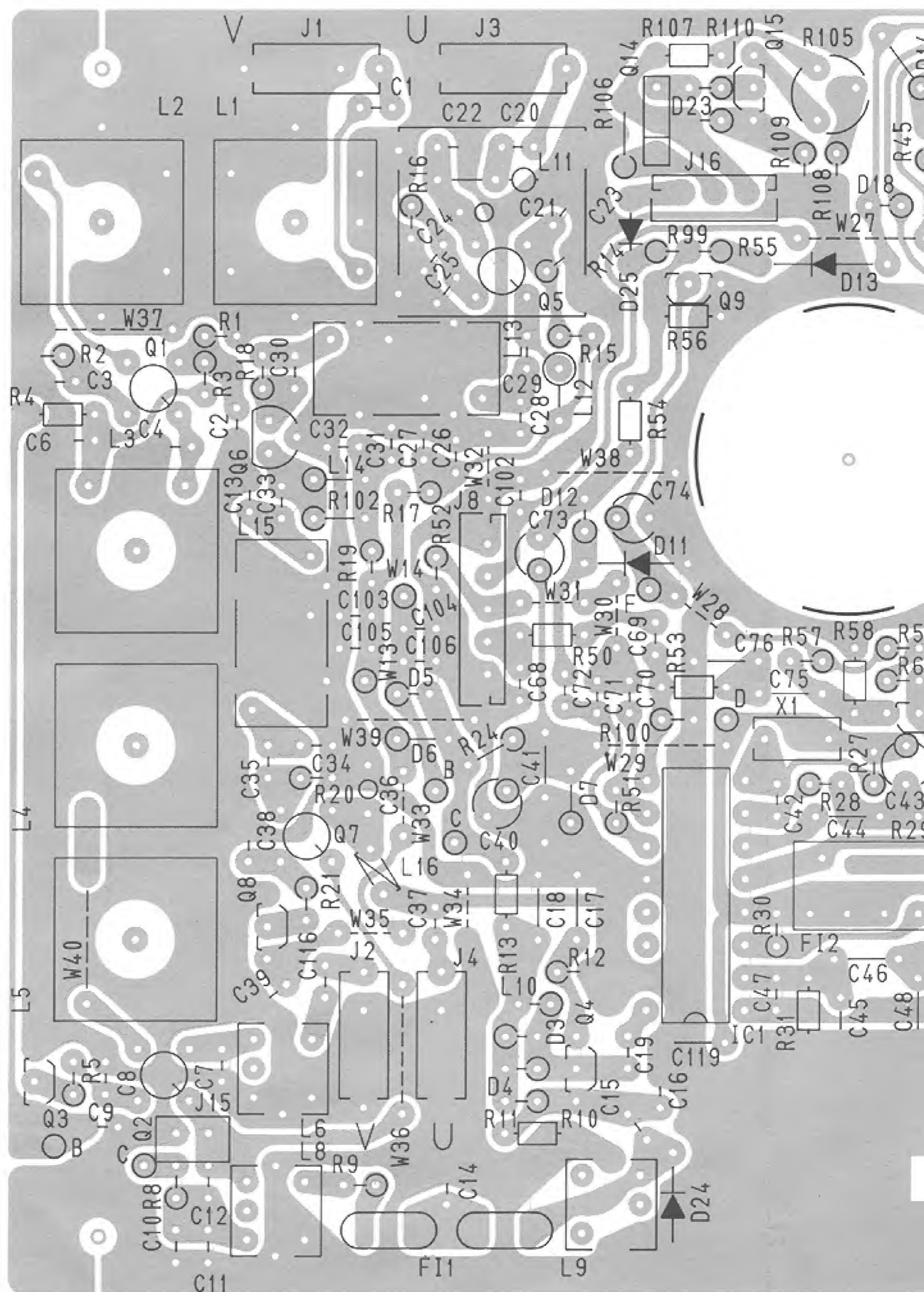


8 - 4 PLL-YGR UNIT CONNECTOR ASSEMBLY

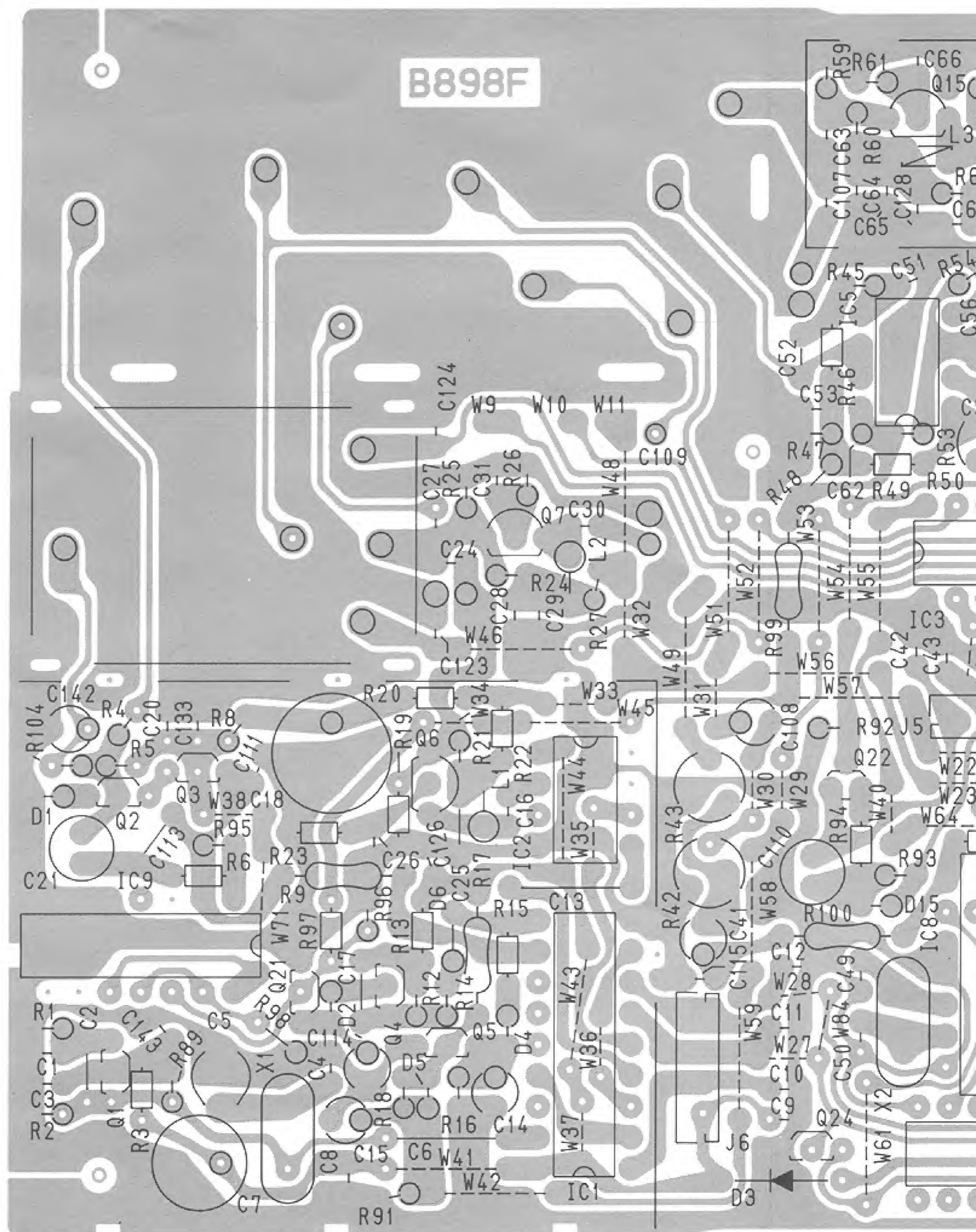


SECTION 9 BOARD LAYOUTS

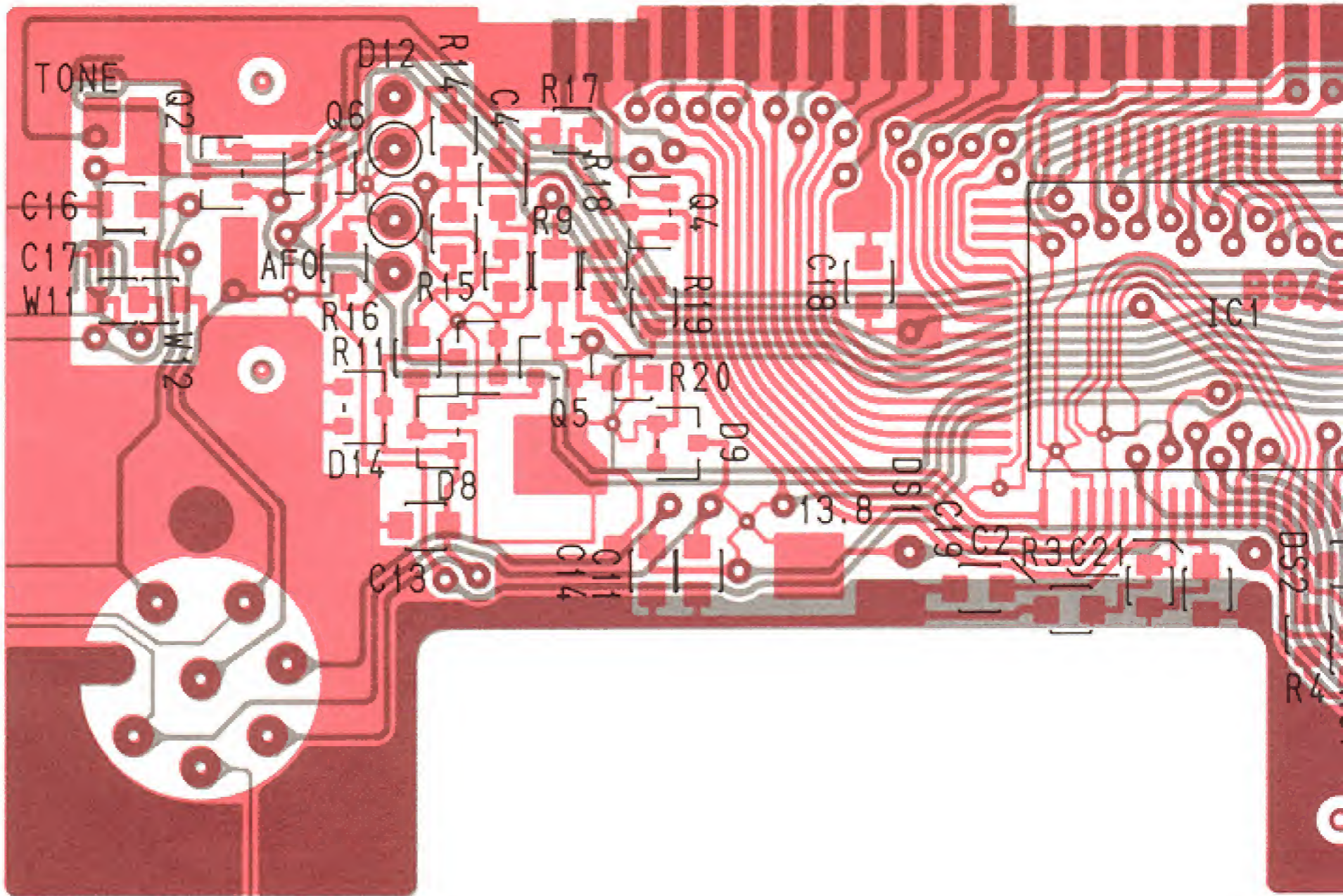
9 - 1 MAIN UNIT



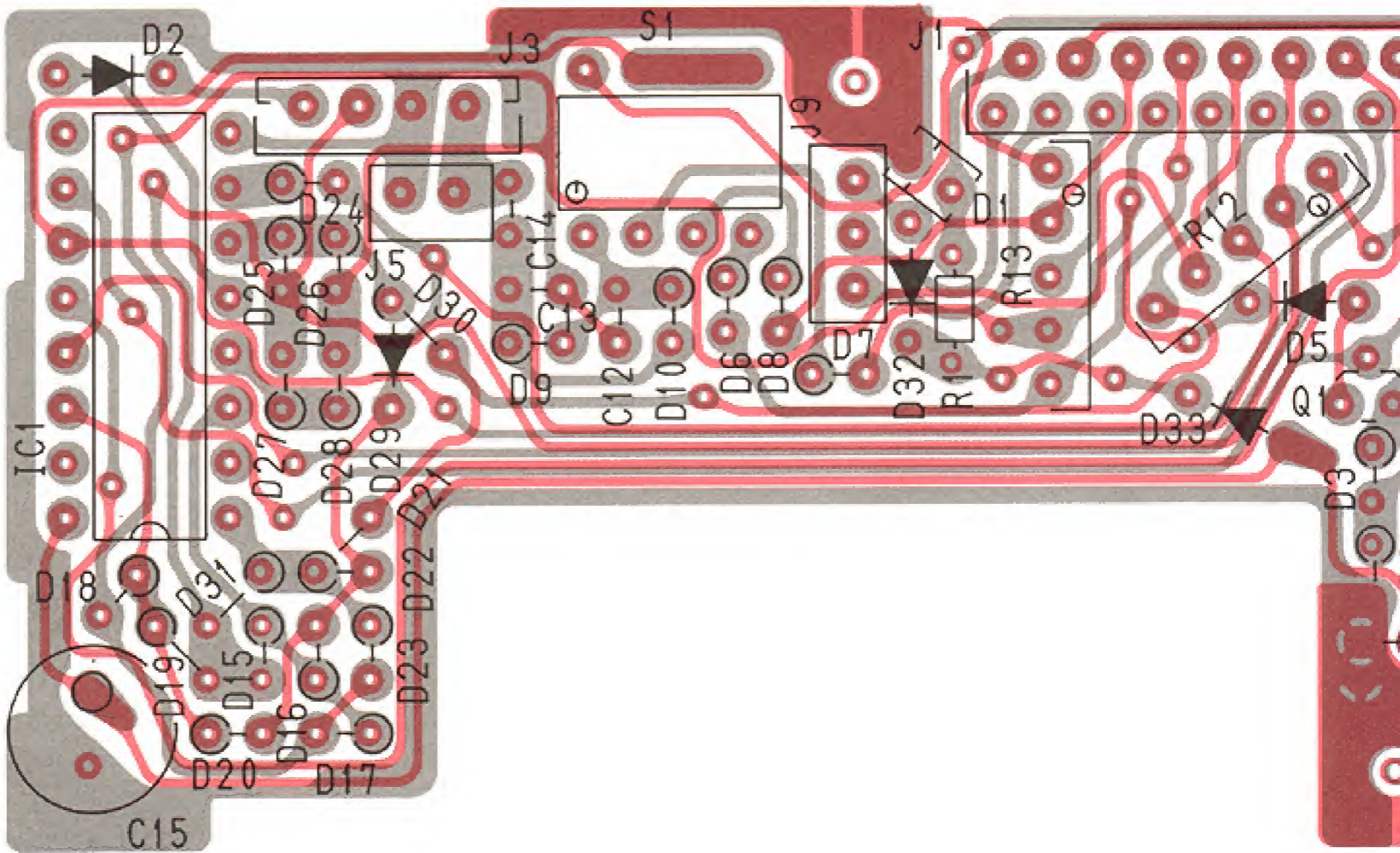


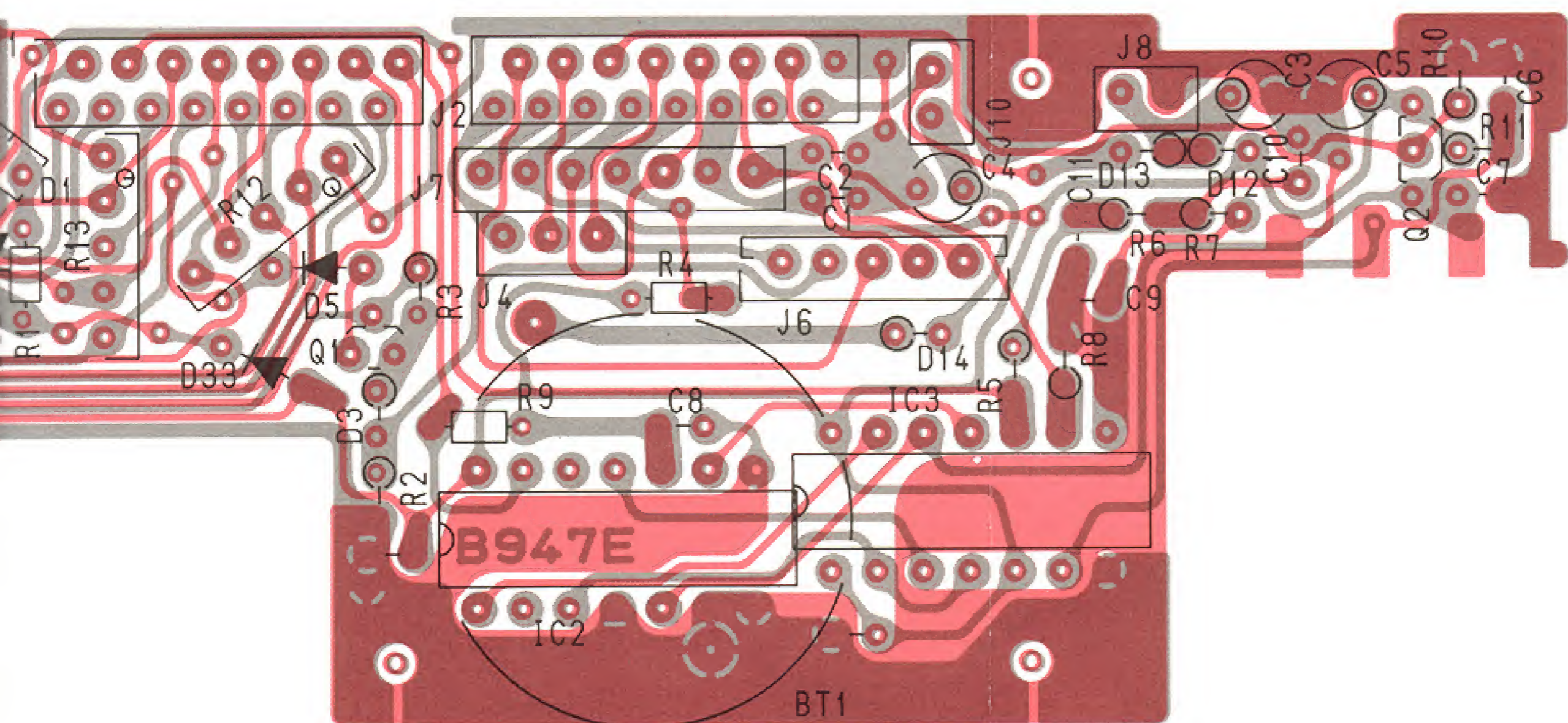
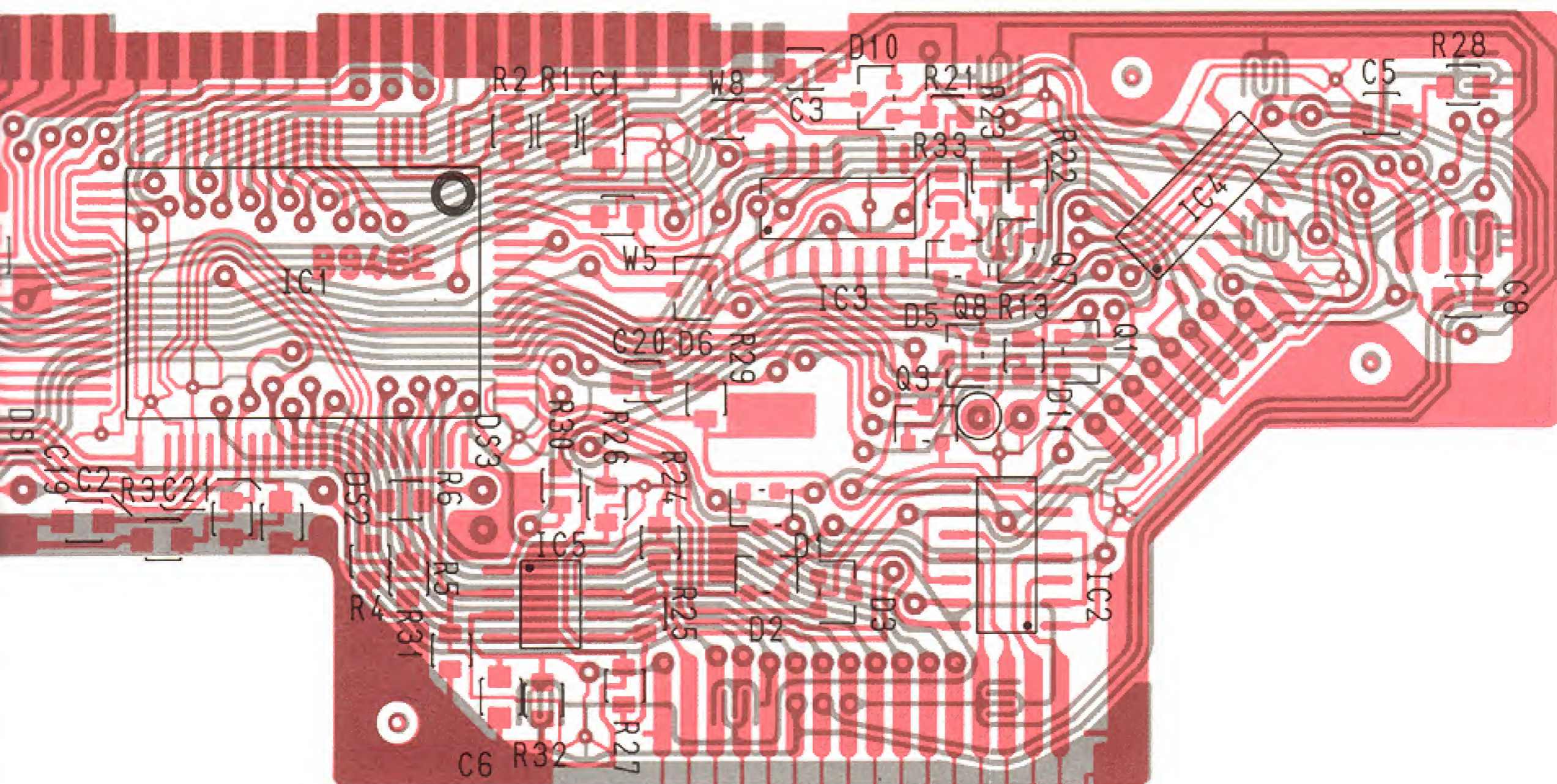


9 - 3 LOGIC A UNIT

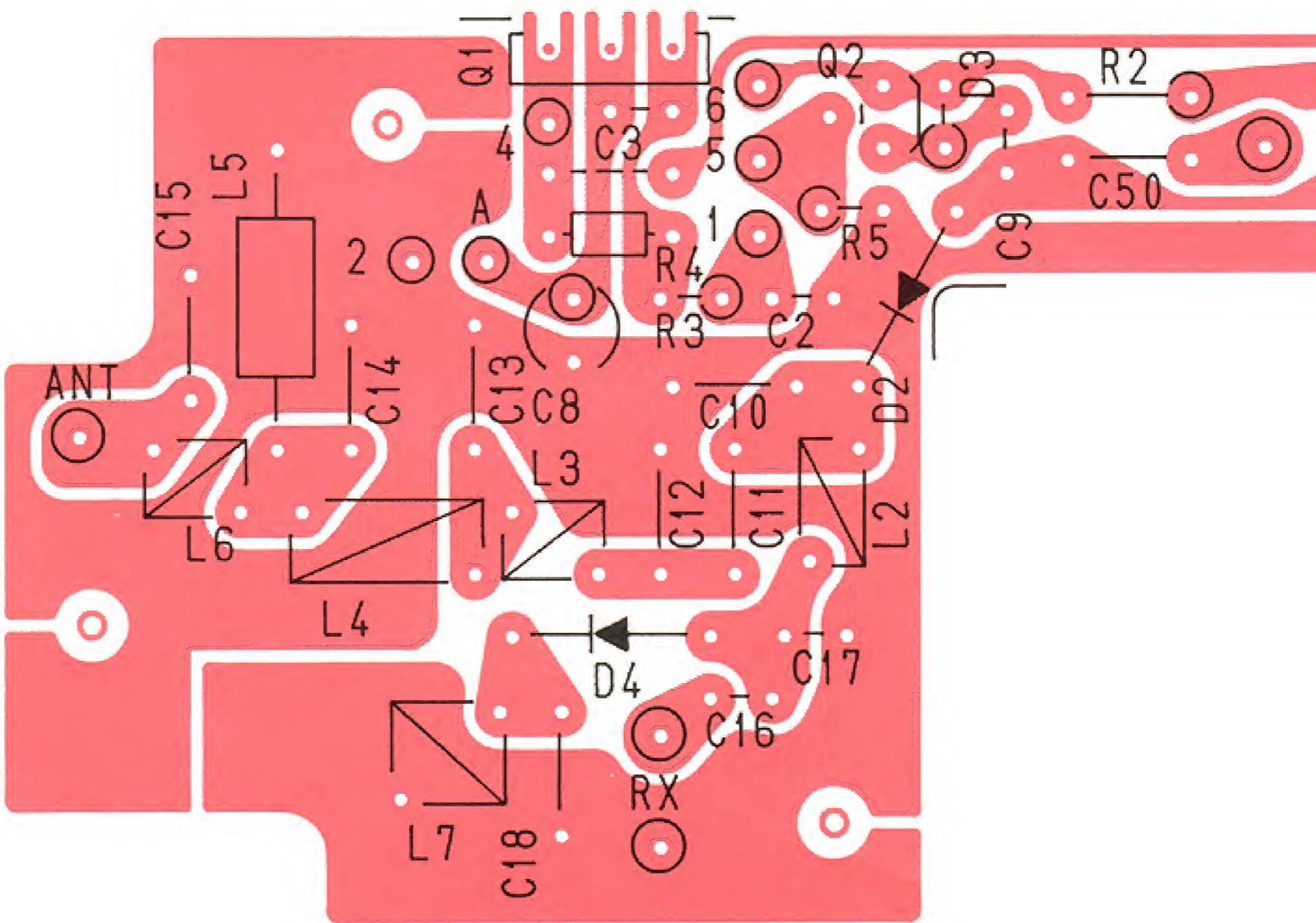


9 - 4 LOGIC B UNIT

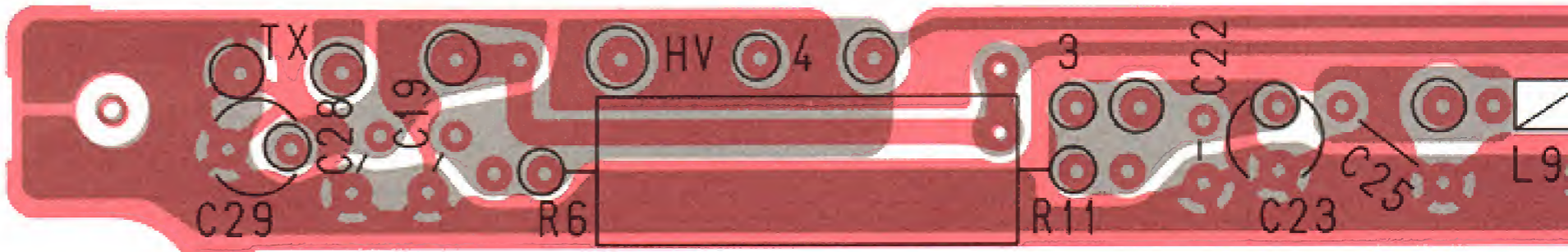


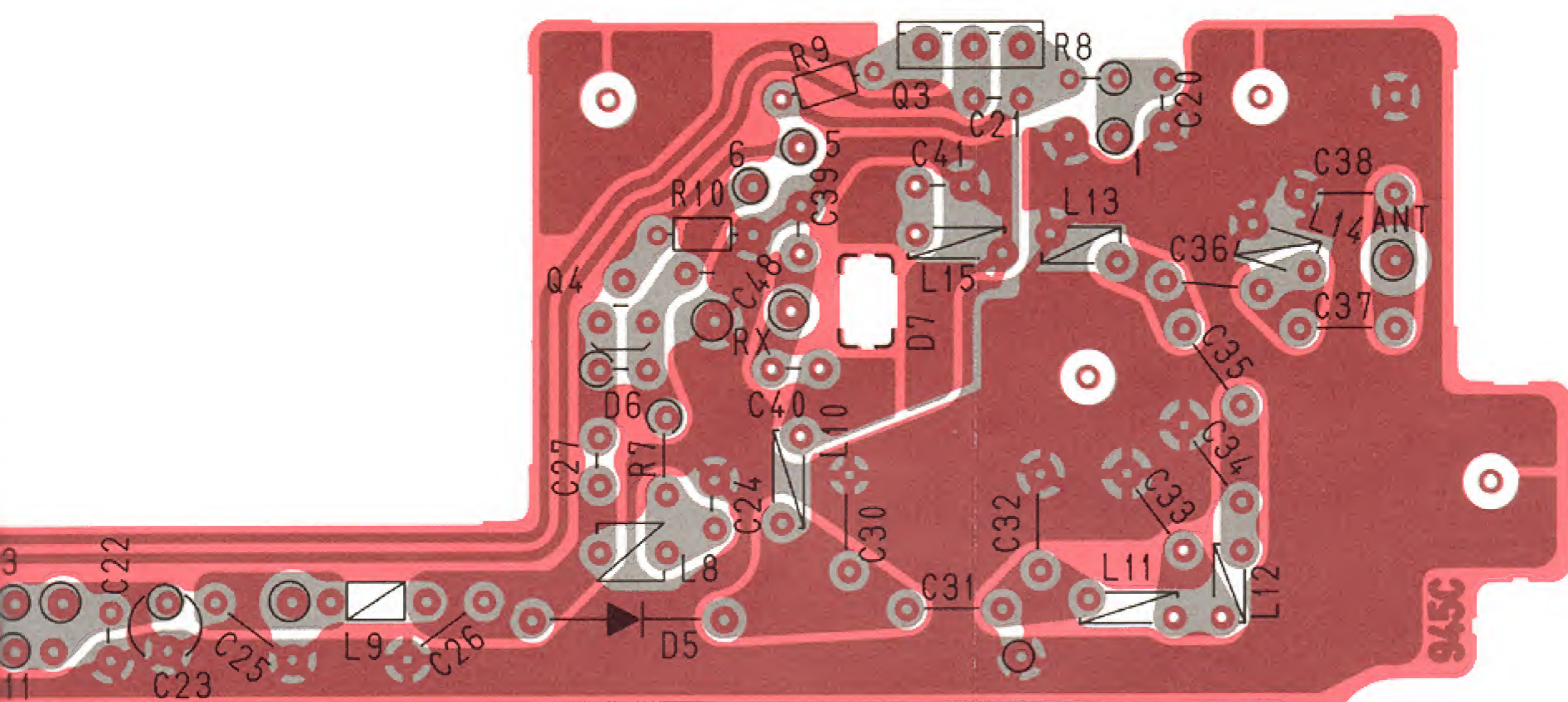
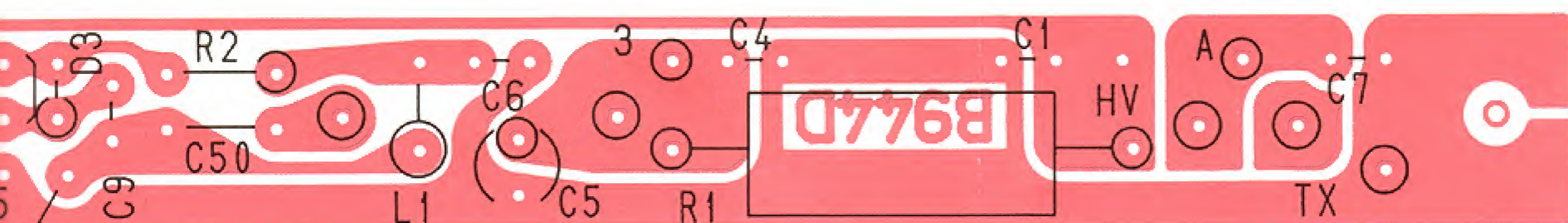


9 - 5 PA (VHF) UNIT

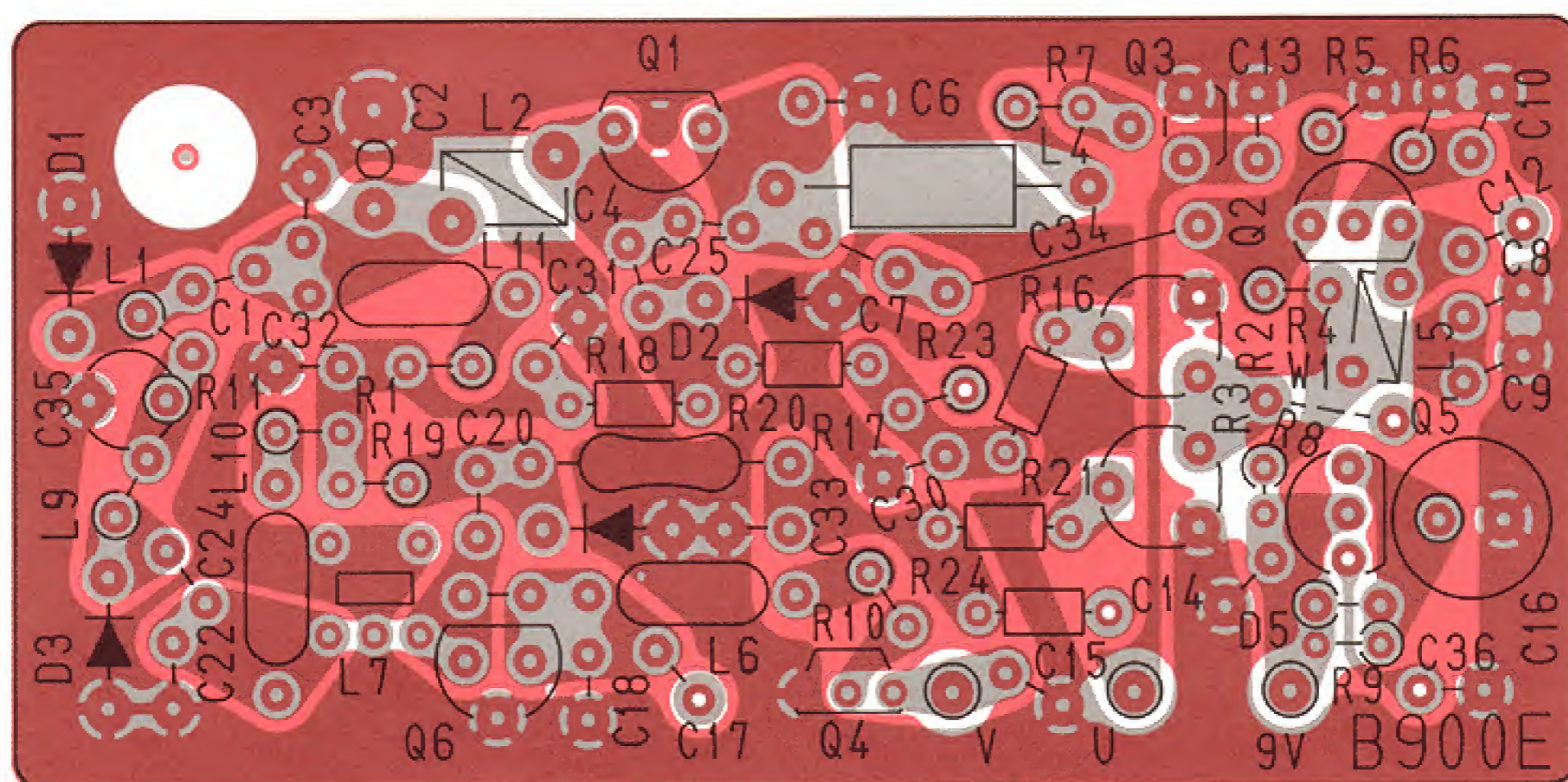


9 - 6 PA (UHF) UNIT

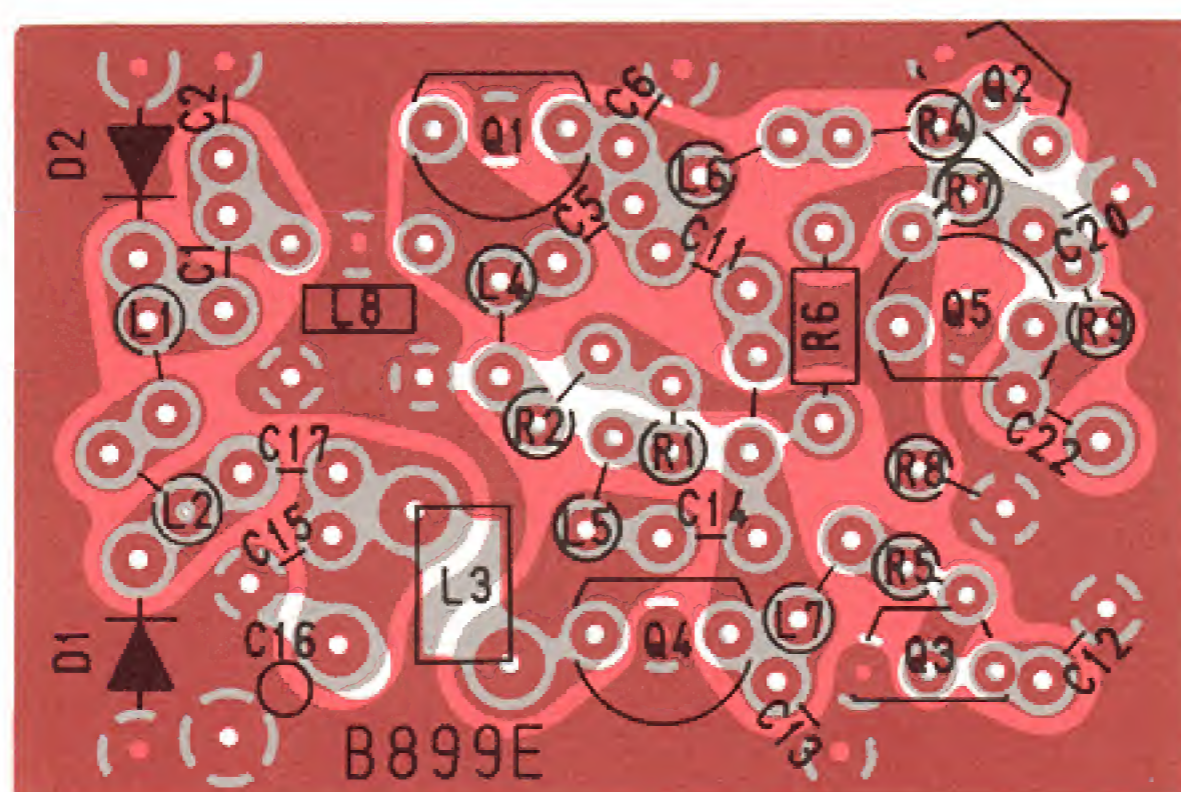




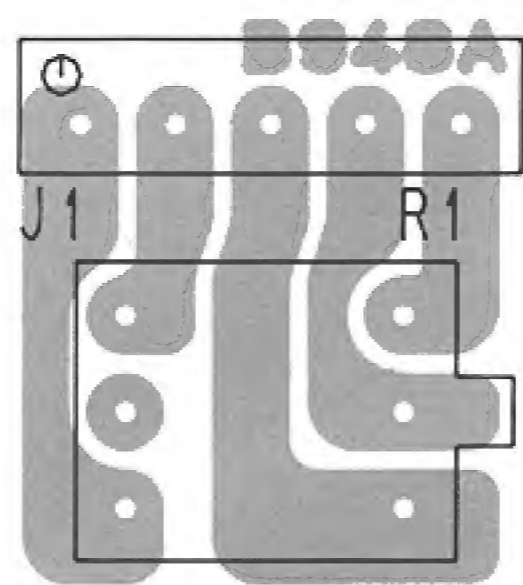
9 - 7 TX VCO UNIT



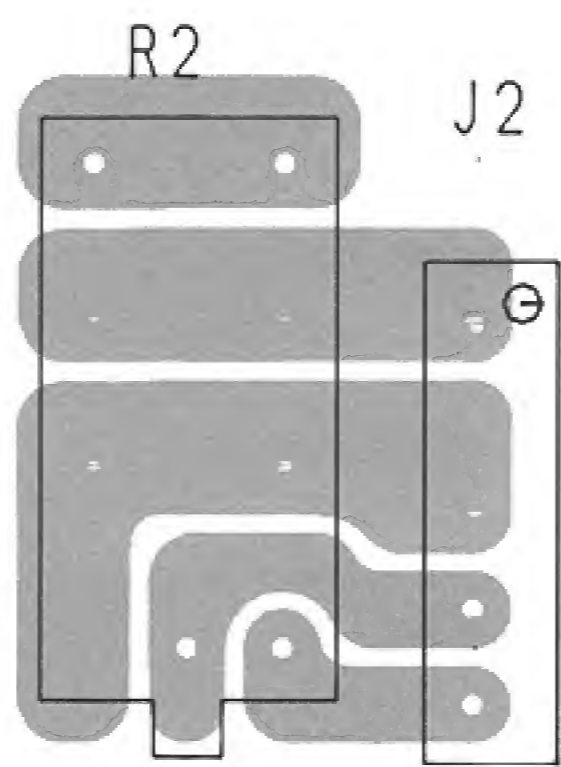
9 - 8 RX VCO UNIT



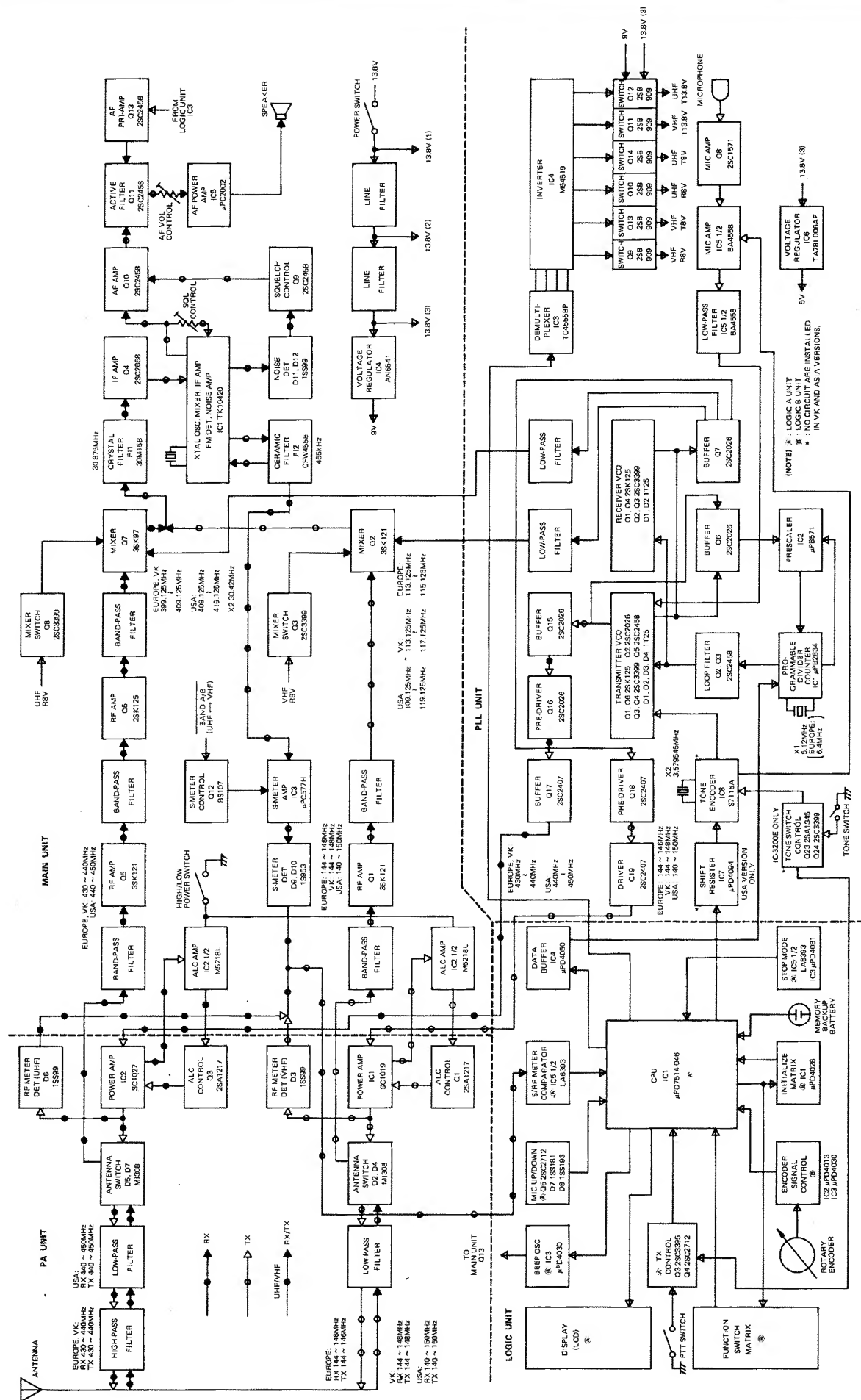
9 - 9 EF (VOL) UNIT



9 - 10 EF (SQL) UNIT



SECTION 10 BLOCK DIAGRAM



SECTION 11 IC RATINGS

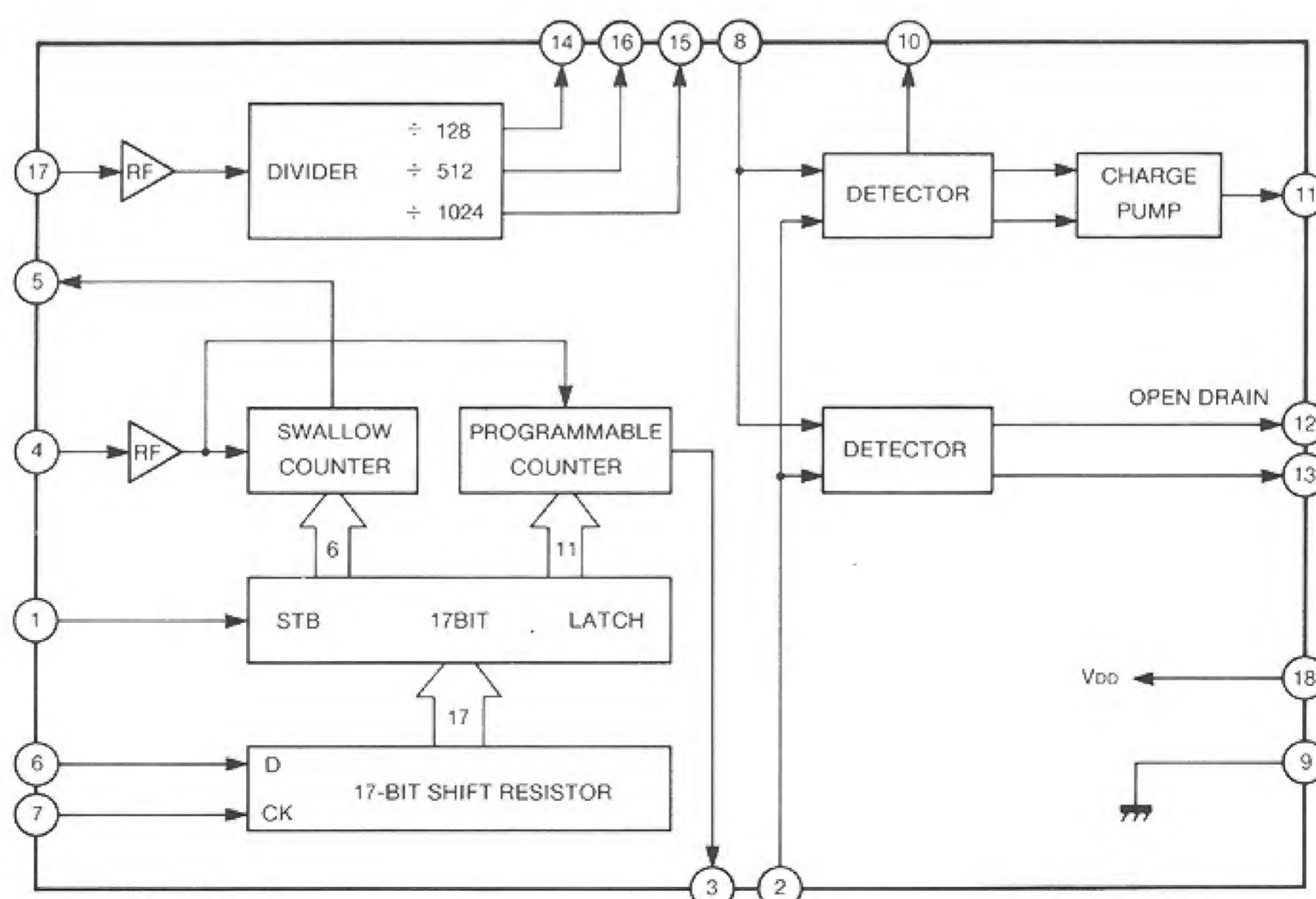
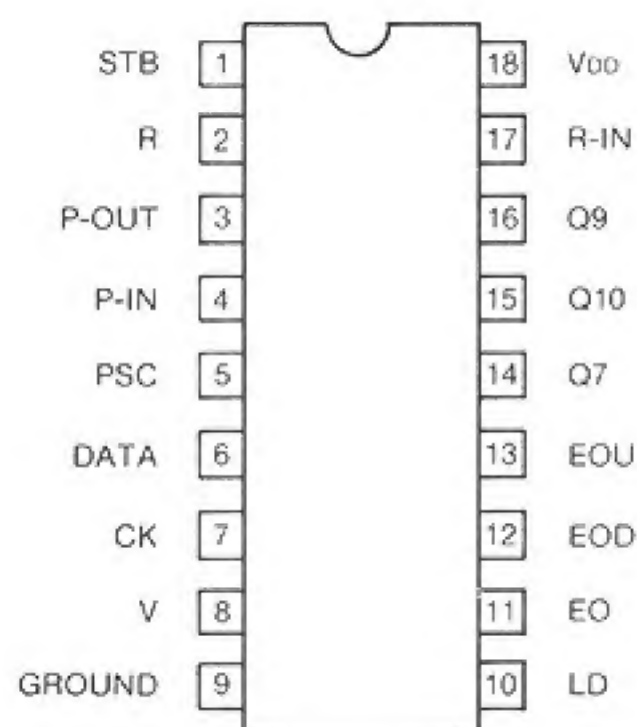
μ PD2834C (PLL FREQUENCY SYNTHESIZER)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|-------------------------------|------|
| Power supply voltage | V _{DD} | -0.3 ~ +7.0 | V |
| Input voltage | V _{IN} | -0.5 ~ +V _{DD} + 0.5 | V |
| Output voltage | V _{OUT} | -0.5 ~ +V _{DD} + 0.5 | V |
| Output voltage* | V _{OUT} | -0.5 ~ +V _{DD} + 3.0 | V |
| Operating temperature | T _{OPR} | -40 ~ +85 | °C |
| Storage temperature | T _{STG} | -65 ~ +150 | °C |

*EOU pin only

PIN CONNECTION (Top View)

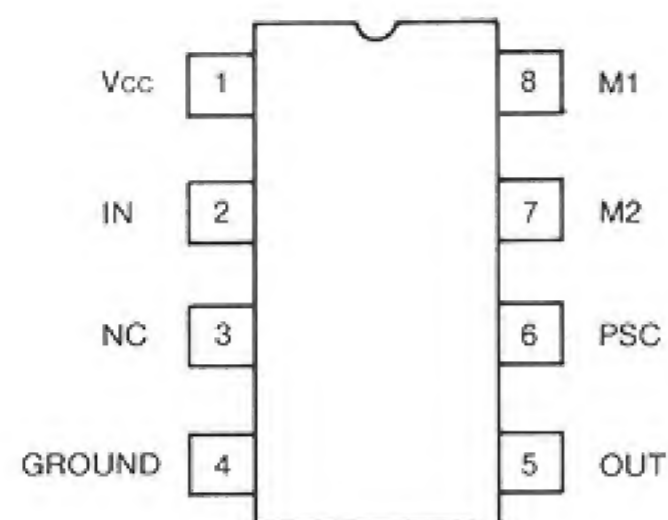


μ PB571C (LOW POWER PRE-SCALER)

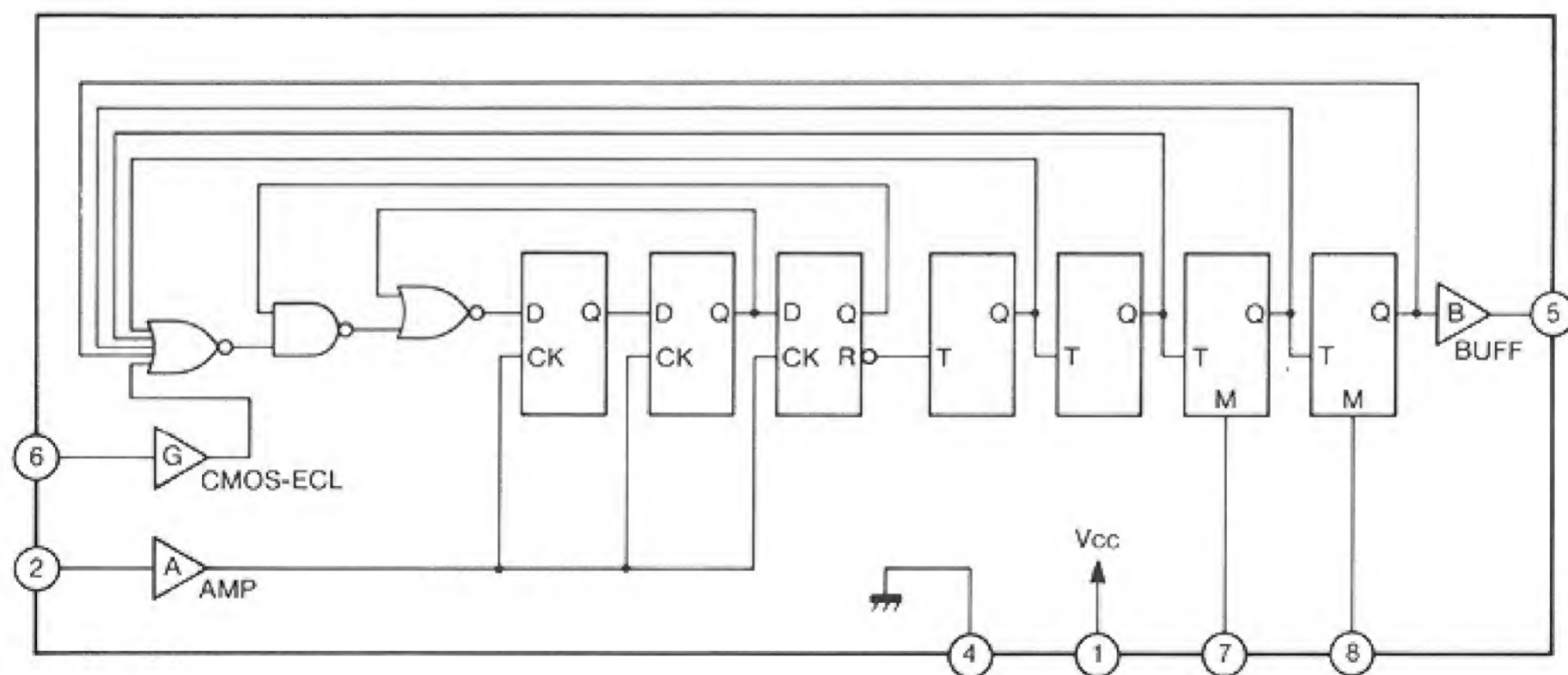
MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|-----------|---------------------------|------------------|
| Power supply voltage | V_{CC} | $-0.5 \sim +6.0$ | V |
| Input voltage | V_{IN} | $-0.5 \sim +V_{CC} + 0.5$ | V |
| Maximum drive current | I_{OUT} | -10 | mA |
| Storage temperature | T_{STG} | $-55 \sim +125$ | $^\circ\text{C}$ |

PIN CONNECTION (Top View)



BLOCK DIAGRAM

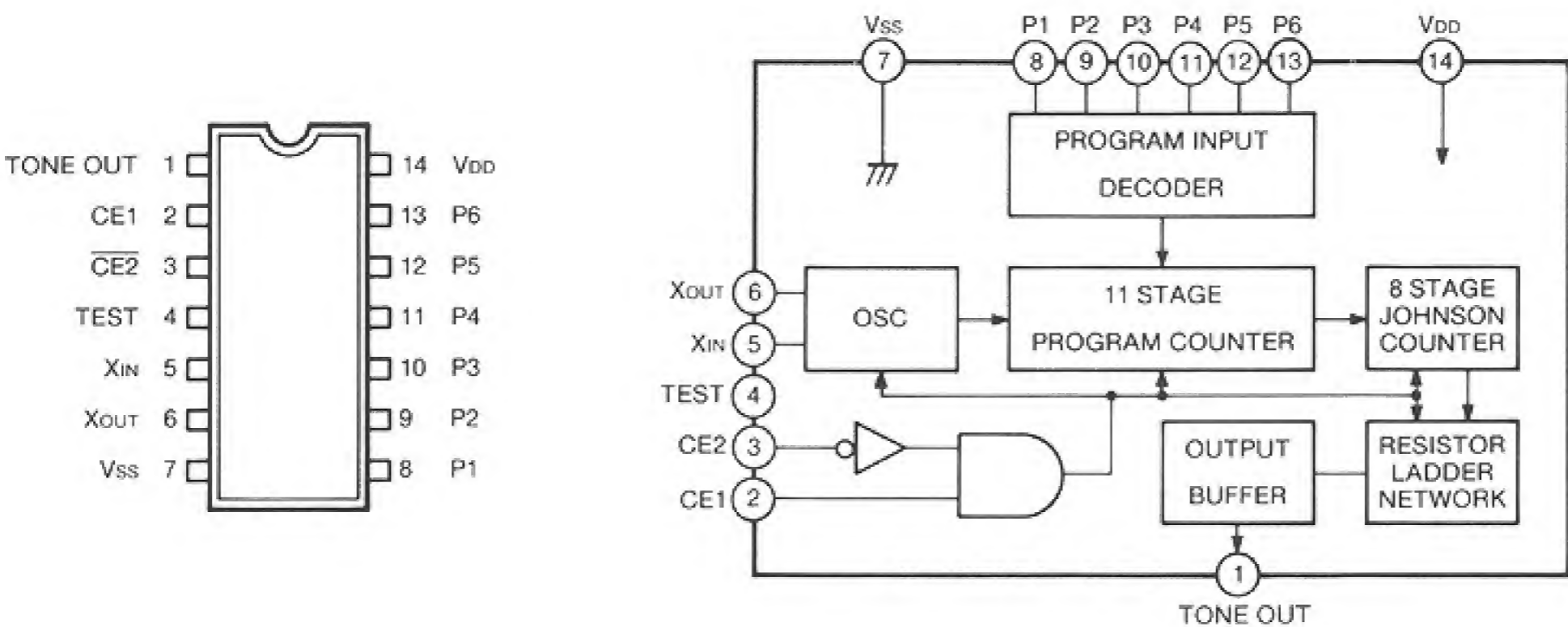


S-7116A (TONE GENERATOR CMOS LSI)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|---|------|
| Power supply voltage | V _{DD} | 12.0 | V |
| Input voltage | V _{IN} | V _{SS} -0.3 ~ V _{DD} +0.3 | V |
| Output voltage | V _{OUT} | V _{SS} -0.3 ~ V _{DD} +0.3 | V |
| Package dissipation | P _D | 300 | mW |
| Operating temperature | T _{OPR} | -25 ~ +70 | °C |
| Storage temperature | T _{STG} | -40 ~ +125 | °C |

PIN CONNECTION (Top View) BLOCK DIAGRAM



P1 ~ P6 CODE VS. TONE FREQUENCY

fosc = 3.579545MHz

| TONE FREQ. | P1 | P2 | P3 | P4 | P5 | P6 | TONE FREQ. | P1 | P2 | P3 | P4 | P5 | P6 | TONE FREQ. | P1 | P2 | P3 | P4 | P5 | P6 |
|------------|----|----|----|----|----|----|------------|----|----|----|----|----|----|------------|----|----|----|----|----|----|
| 67.0 | 1 | 0 | 0 | 0 | 0 | 0 | 131.8 | 0 | 0 | 1 | 0 | 1 | 0 | 500 | 1 | 1 | 1 | 0 | 0 | 1 |
| 71.9 | 0 | 1 | 0 | 0 | 0 | 0 | 136.5 | 1 | 0 | 1 | 0 | 1 | 0 | 600 | 0 | 0 | 0 | 1 | 0 | 1 |
| 74.4 | 1 | 1 | 0 | 0 | 0 | 0 | 141.3 | 0 | 1 | 1 | 0 | 1 | 0 | 700 | 1 | 0 | 0 | 1 | 0 | 1 |
| 77.0 | 0 | 0 | 1 | 0 | 0 | 0 | 146.2 | 1 | 1 | 1 | 0 | 1 | 0 | 800 | 0 | 1 | 0 | 1 | 0 | 1 |
| 79.7 | 1 | 0 | 1 | 0 | 0 | 0 | 151.4 | 0 | 0 | 0 | 1 | 1 | 0 | 900 | 1 | 1 | 0 | 1 | 0 | 1 |
| 82.5 | 0 | 1 | 1 | 0 | 0 | 0 | 156.7 | 1 | 0 | 0 | 1 | 1 | 0 | 1000 | 0 | 0 | 1 | 1 | 0 | 1 |
| 85.4 | 1 | 1 | 1 | 0 | 0 | 0 | 162.2 | 0 | 1 | 0 | 1 | 1 | 0 | 1600 | 1 | 0 | 1 | 1 | 0 | 1 |
| 88.5 | 0 | 0 | 0 | 1 | 0 | 0 | 167.9 | 1 | 1 | 0 | 1 | 1 | 0 | 1700 | 0 | 1 | 1 | 1 | 0 | 1 |
| 91.5 | 1 | 0 | 0 | 1 | 0 | 0 | 173.8 | 0 | 0 | 1 | 1 | 1 | 0 | 1750 | 1 | 1 | 1 | 1 | 0 | 1 |
| 94.8 | 0 | 1 | 0 | 1 | 0 | 0 | 179.9 | 1 | 0 | 1 | 1 | 1 | 0 | 1800 | 0 | 0 | 0 | 0 | 1 | 1 |
| 97.4 | 1 | 1 | 0 | 1 | 0 | 0 | 186.2 | 0 | 1 | 1 | 1 | 1 | 0 | 1300 | 1 | 0 | 0 | 0 | 1 | 1 |
| 100.0 | 0 | 0 | 1 | 1 | 0 | 0 | 192.8 | 1 | 1 | 1 | 1 | 1 | 0 | 2000 | 0 | 1 | 0 | 0 | 1 | 1 |
| 103.5 | 1 | 0 | 1 | 1 | 0 | 0 | 203.5 | 0 | 0 | 0 | 0 | 0 | 1 | 2200 | 1 | 1 | 0 | 0 | 1 | 1 |
| 107.2 | 0 | 1 | 1 | 1 | 0 | 0 | 210.7 | 1 | 0 | 0 | 0 | 0 | 1 | 2975 | 0 | 0 | 1 | 0 | 1 | 1 |
| 110.9 | 1 | 1 | 1 | 1 | 0 | 0 | 218.1 | 0 | 1 | 0 | 0 | 0 | 1 | 2550 | 1 | 0 | 1 | 0 | 1 | 1 |
| 114.8 | 0 | 0 | 0 | 0 | 1 | 0 | 225.7 | 1 | 1 | 0 | 0 | 0 | 1 | 2295 | 0 | 1 | 1 | 0 | 1 | 1 |
| 118.8 | 1 | 0 | 0 | 0 | 1 | 0 | 233.6 | 0 | 0 | 1 | 0 | 0 | 1 | 2125 | 1 | 1 | 1 | 0 | 1 | 1 |
| 123.0 | 0 | 1 | 0 | 0 | 1 | 0 | 241.8 | 1 | 0 | 1 | 0 | 0 | 1 | 1275 | 0 | 0 | 0 | 1 | 1 | 1 |
| 127.3 | 1 | 1 | 0 | 0 | 1 | 0 | 250.3 | 0 | 1 | 1 | 0 | 0 | 1 | 1445 | 1 | 0 | 0 | 1 | 1 | 1 |

1 = V_{DD} level
0 = V_{SS} level

unit: Hz

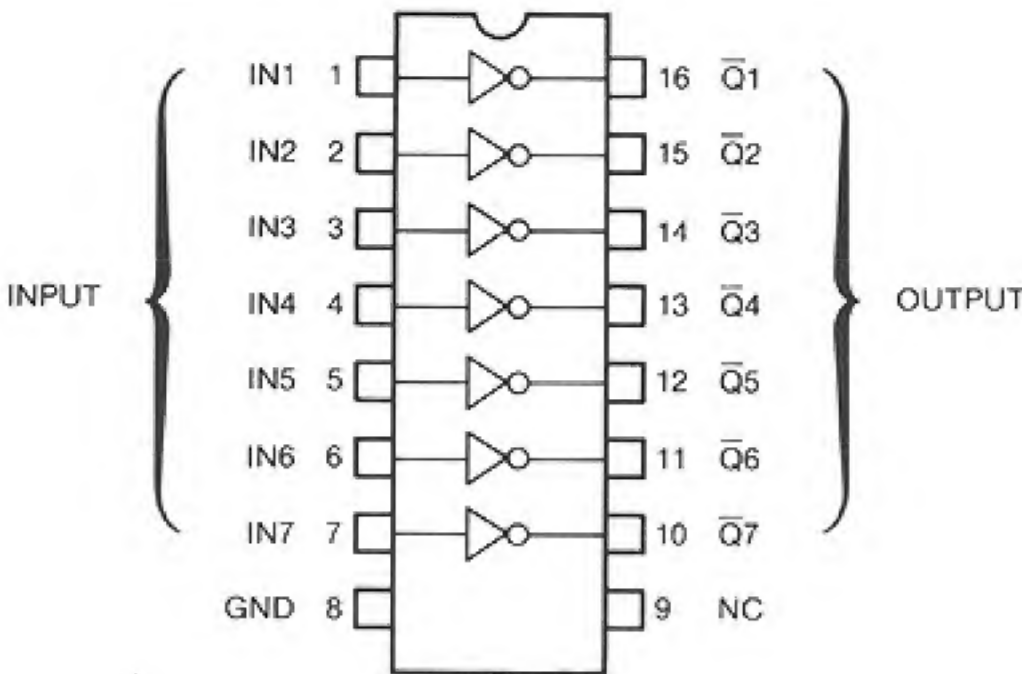
M54519P (7-UNIT 400mA DARLINGTON TRANSISTOR ARRAY)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|---------------------------|-----------|----------|------|
| Collector/Emitter voltage | V_{CEO} | 40 *1 | V |
| Collector voltage | I_C | 400 *2 | mA |
| Input voltage | V_{IN} | 40 | V |
| Package dissipation | P_D | 1.47 *3 | W |
| Operating temperature | T_{OPR} | -20~+75 | °C |
| Storage temperature | T_{STG} | -55~+125 | °C |

*1: When the output becomes "H" *2: When the output becomes "L" *3: $T_a = 25^{\circ}\text{C}$

PIN CONNECTION (Top View)

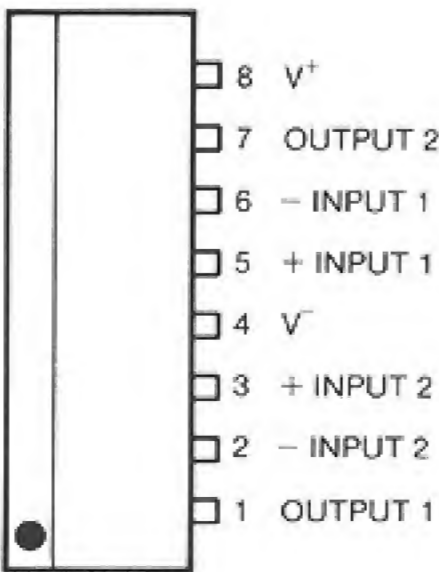


M5218L (LOW NOISE DUAL OPERATIONAL AMPLIFIER)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|----------------------------|-----------|----------|------|
| Power supply voltage | V_{CC} | ± 18 | V |
| Output current | I_{LP} | ± 50 | mA |
| Differential input voltage | V_{ID} | ± 30 | V |
| Input voltage | V_{IC} | ± 15 | V |
| Package dissipation | P_D | 800 | mW |
| Operating temperature | T_{OPR} | -20~+75 | °C |
| Storage temperature | T_{STG} | -55~+125 | °C |

PIN CONNECTION

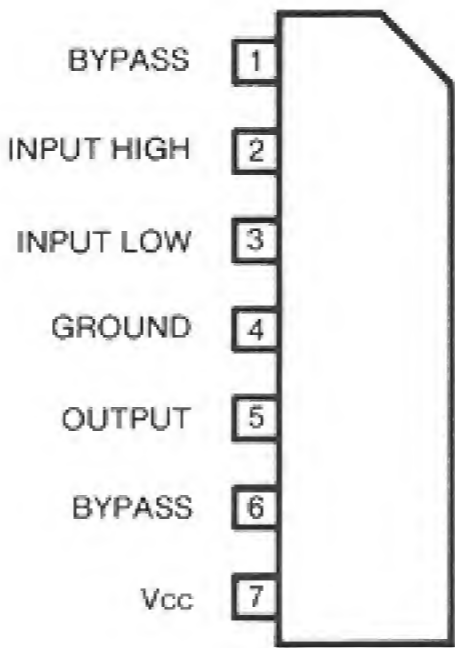


μPC577H (FM-IF AMPLIFIER)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------|------|
| Power supply voltage | V _{CC} | 15 | V |
| Input voltage | V _{IN} | ±3.0 | V |
| Package dissipation | P _D | 300 | mW |
| Operating temperature | T _{OPT} | −20 ~ +75 | °C |
| Storage temperature | T _{STG} | −40 ~ +125 | °C |

PIN CONNECTION

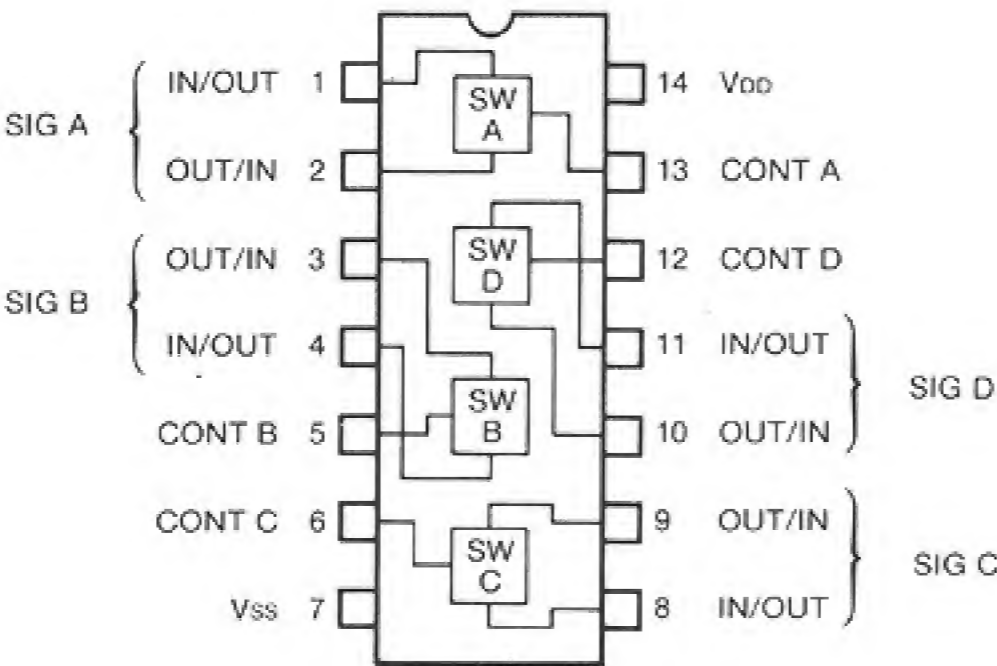


μPD4066BC (QUAD BILATERAL SWITCH)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|----------------------------------|-----------------------------|------|
| Power supply voltage | V _{DD} —V _{SS} | −0.5 ~ +20 | V |
| Input voltage | V _{IS} | −0.5 ~ V _{DD} +0.5 | V |
| Input current | I _{IN} | 10 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OPT} | −40 ~ +85 | °C |
| Storage temperature | T _{STG} | −65 ~ +125 | °C |

PIN CONNECTION (Top View)

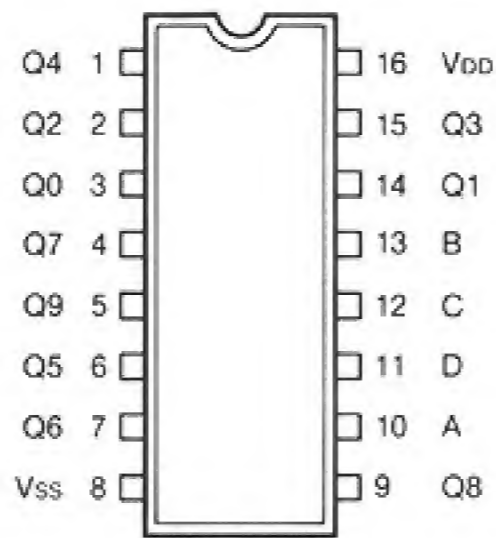


μPD4028BC (BCD TO DECIMAL DECODER)

MAXIMUM RATINGS (Ta = 25° C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------------------------|------|
| Power supply voltage | V _{DD} | -0.5 ~ +20 | V |
| Input voltage | V _{IN} | -0.5 ~ V _{DD} + 0.5 | V |
| Input current | I _{IN} | 10 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OP} | -40 ~ +85 | °C |
| Storage temperature | T _{STG} | -65 ~ +125 | °C |

PIN CONNECTION (Top View)

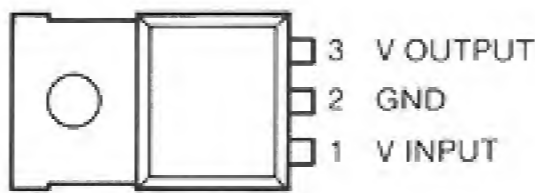


AN6541 (9V 3-TERMINAL POSITIVE VOLTAGE REGULATOR)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------|------|
| Power supply voltage | V _{IN} | 20 | V |
| Package dissipation | P _D | 15 | W |
| Operating temperature | T _{OP} | -30 ~ +80 | °C |
| Storage temperature | T _{STG} | -40 ~ +150 | °C |

PIN CONNECTION

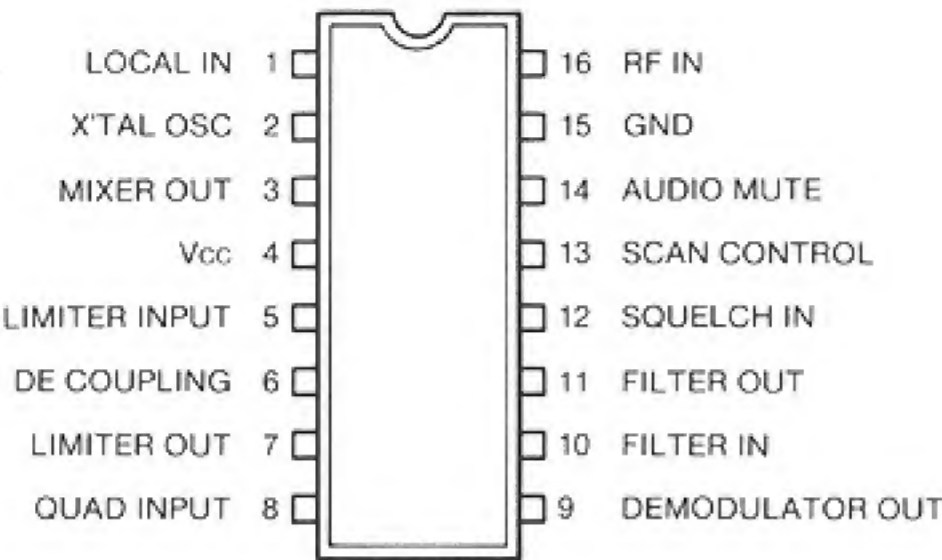


TK10420 (FM IF)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-------------------------|--------|------------|------|
| Power supply voltage | VCC | 12 | V |
| Dissipation | PD | 540 | mW |
| Operating voltage range | VOP | 4 ~ 10 | V |
| Operating temperature | TOPR | -30 ~ +70 | °C |
| Storage temperature | TSTG | -55 ~ +125 | °C |

PIN CONNECTION (Top View)



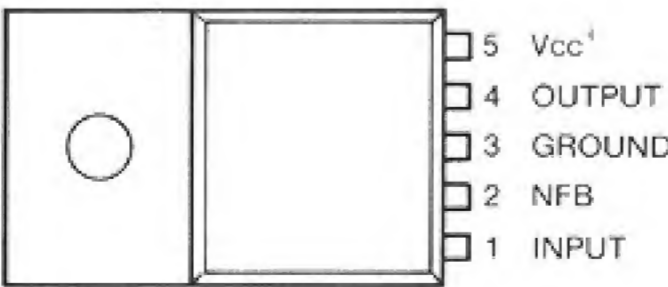
μPC2002 (5.4W AUDIO POWER AMP.)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|--------------------------------------|--------------|------------|------|
| Peak supply voltage | Vcc 1 (50ms) | 40 | V |
| DC supply voltage (quiescent) | Vcc 2 | 28 | V |
| DC supply voltage (operational) | Vcc 3 | 18 | V |
| Output peak current (repetitive) | Icc (PEAK) 1 | 3.5 | A |
| Output peak current (non-repetitive) | Icc (PEAK) 2 | 4.5 | A |
| Package dissipation | Po | 15* | W |
| Operating temperature | TOPR | -30 ~ +75 | °C |
| Storage temperature | TSTG | -40 ~ +150 | °C |

*Tc = 90°C

PIN CONNECTION

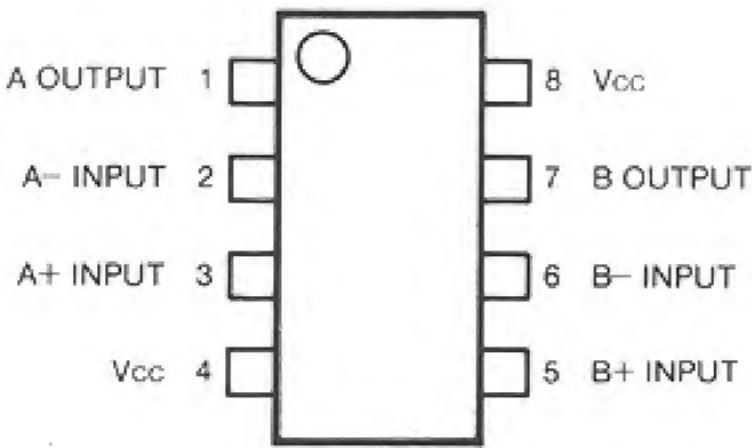


NJM4558 (DUAL LOW NOISE OPERATIONAL AMPLIFIER)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------|------|
| Power supply voltage | V _{DD} | ±18 | V |
| Input voltage | V _{IN} | ±15 | V |
| Operating temperature | T _{OPR} | −20 ~ +75 | °C |
| Storage temperature | T _{STG} | −40 ~ +125 | °C |

PIN CONNECTION

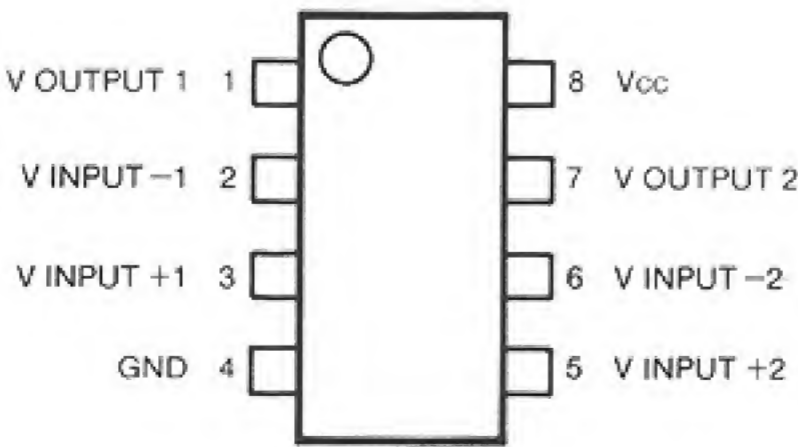


LA6393M (DUAL COMPARATOR)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|----------------------------|------------------|------------|------|
| Power supply voltage | V _{CC} | 36 | V |
| Differential input voltage | V _{ID} | 36 | V |
| Input voltage | V _{ICM} | −0.3 ~ +36 | V |
| Package dissipation | P _D | 300 | mW |
| Operating temperature | T _{OPG} | −30 ~ +85 | °C |
| Storage temperature | T _{STG} | −55 ~ +125 | °C |

PIN CONNECTION

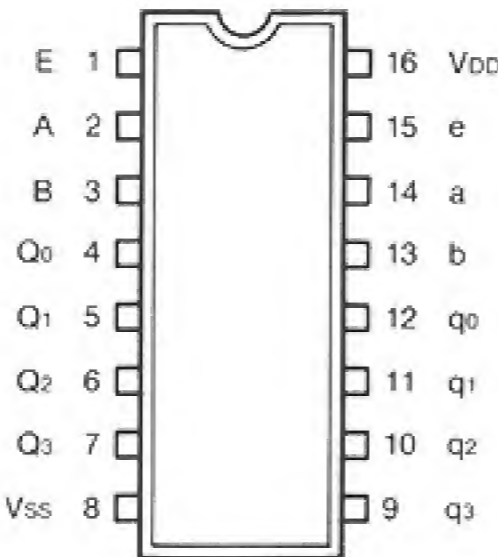


TC4555BP (DUAL BINARY TO 1-OF-4 DECODER/DEMULTIPLEXER “H”-LEVEL)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|----------------------|------------------|---|------|
| Power supply voltage | V _{DD} | V _{SS} −0.5 ~ V _{SS} +20 | V |
| Input voltage | V _{IN} | V _{SS} −0.5 ~ V _{DD} +0.5 | V |
| Output voltage | V _{OUT} | V _{SS} −0.5 ~ V _{DD} +0.5 | V |
| Input current | I _{IN} | ±10 | mA |
| Package dissipation | P _D | 300 | mW |
| Storage temperature | T _{STG} | −65 ~ +150 | °C |

PIN CONNECTION (Top View)

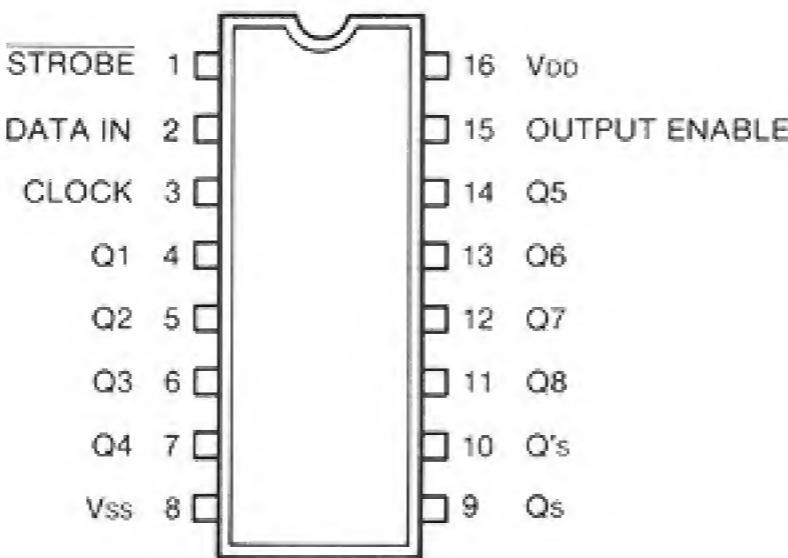


TC4094BP (8-STAGE SHIFT-AND-STORE BUS REGISTER)

MAXIMUM RATINGS

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|----------------------|------------------|---|------|
| Power supply voltage | V _{DD} | V _{SS} −0.5 ~ V _{SS} +20 | V |
| Input voltage | V _{IN} | V _{SS} −0.5 ~ V _{DD} +0.5 | V |
| Output voltage | V _{OUT} | V _{SS} −0.5 ~ V _{DD} +0.5 | V |
| Input current | I _{IN} | ±10 | mA |
| Package dissipation | P _D | 300 | mW |
| Storage temperature | T _{STG} | −65 ~ +150 | °C |

PIN CONNECTION (Top View)

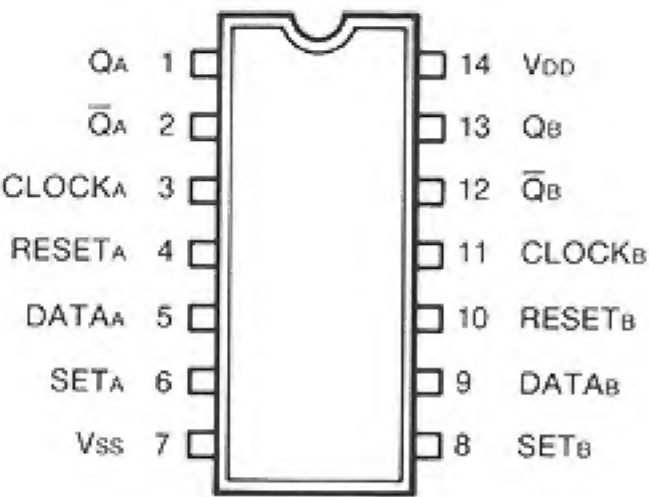


μPD4013BC (DUAL D-TYPE FLIP-FLOP)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------------------------|------|
| Power supply voltage | V _{DD} | −0.5 ~ +20 | V |
| Input voltage | V _{IN} | −0.5 ~ V _{DD} + 0.5 | V |
| Input current | I _{IN} | 10 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OPT} | −40 ~ +85 | °C |
| Storage temperature | T _{STG} | −65 ~ +125 | °C |

PIN CONNECTION (Top View)

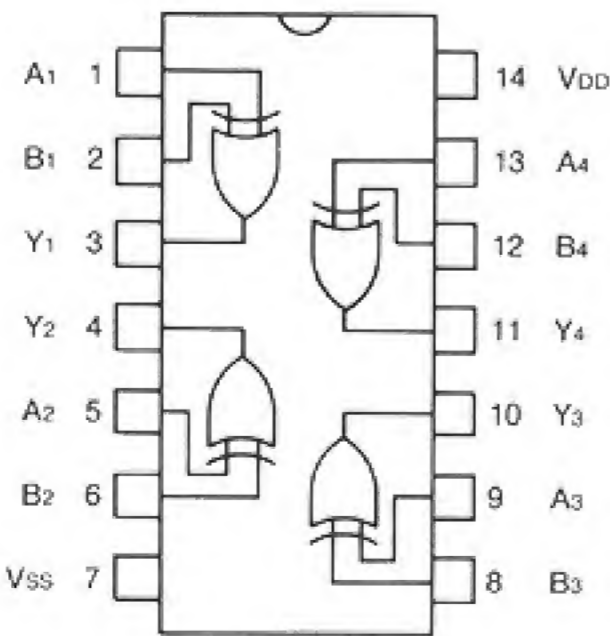


μPD4030BC (QUAD EXCLUSIVE OR GATE)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------------------------|------|
| Power supply voltage | V _{DD} | −0.5 ~ +20 | V |
| Input voltage | V _{IN} | −0.5 ~ V _{DD} + 0.5 | V |
| Input current | I _{IN} | 10 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OPT} | −40 ~ +85 | °C |
| Storage temperature | T _{STG} | −65 ~ +125 | °C |

PIN CONNECTION (Top View)

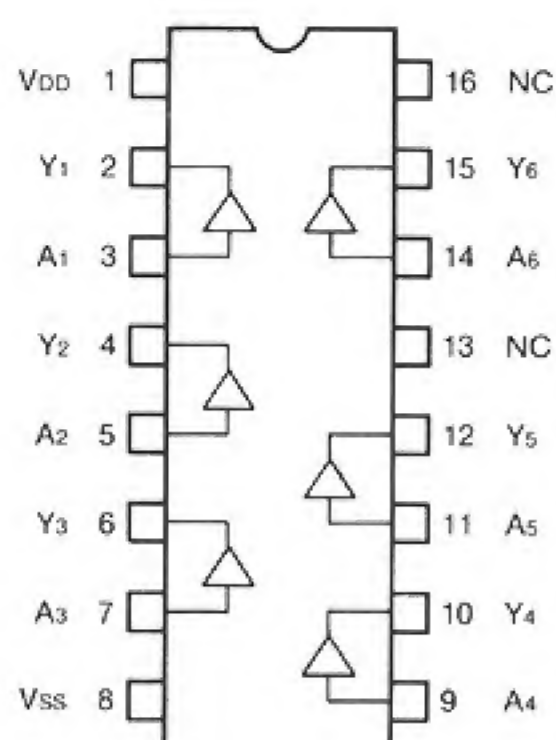


μPD4050BG (HEX. BUFFER/CONVERTER)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------|------|
| Power supply voltage | V _{DD} | -0.5 ~ +20 | V |
| Input voltage | V _{IN} | -0.5 ~ +20 | V |
| Input current | I _{IN} | 10 | mA |
| Maximum drive current | I _{OUT} | 45 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OPT} | -40 ~ +85 | °C |
| Storage temperature | T _{STG} | -65 ~ +125 | °C |

PIN CONNECTION (Top View)

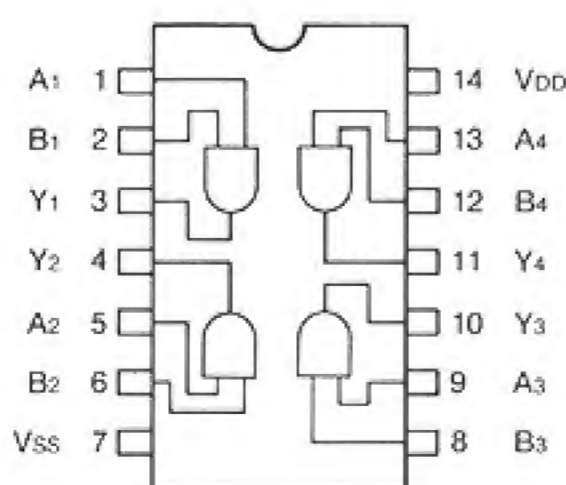


μPD4081BG (QUAD 2-INPUT AND GATE)

MAXIMUM RATINGS (Ta = 25°C)

| DESCRIPTION | SYMBOL | RATINGS | UNIT |
|-----------------------|------------------|------------------------------|------|
| Power supply voltage | V _{DD} | -0.5 ~ +20 | V |
| Input voltage | V _{IN} | -0.5 ~ V _{DD} + 0.5 | V |
| Input current | I _{IN} | 10 | mA |
| Package dissipation | P _D | 200 | mW |
| Operating temperature | T _{OPT} | -40 ~ +85 | °C |
| Storage temperature | T _{STG} | -65 ~ +125 | °C |

PIN CONNECTION (Top View)



SECTION 12 OPTIONAL UNITS

Part of the tremendous versatility in the IC-3200A/E is its adaptability to base station use when not being used as a mobile unit.

The following recommended options will help complement your new base station system.

PS-45 AC POWER SUPPLY



The **OPC-102 INTERFACE CABLE** for connecting the PS-45 to the IC-3200A/E must be purchased separately.

SM-10 COMPRESSOR/GRAPHIC DESK MICROPHONE



SM-8 DESK MICROPHONE



SP-10 EXTERNAL SPEAKER

AND FOR MOBILE USE:

AH-32 DUAL BAND MOBILE ANTENNA

The AH-32 (not pictured here) is a specially designed whip antenna for mobile operation with VHF and UHF dual band transceivers. When used with the IC-3200A/E, the AH-32 requires only one feed line and no special duplexer for feeding RF signals into the antenna element.

HS-15 MOBILE FLEXIBLE MICROPHONE

- Uni-directional mic
- Flexible neck
- Connecting cable to HS-15SB SWITCHBOX
- Simple, light for driving ease.



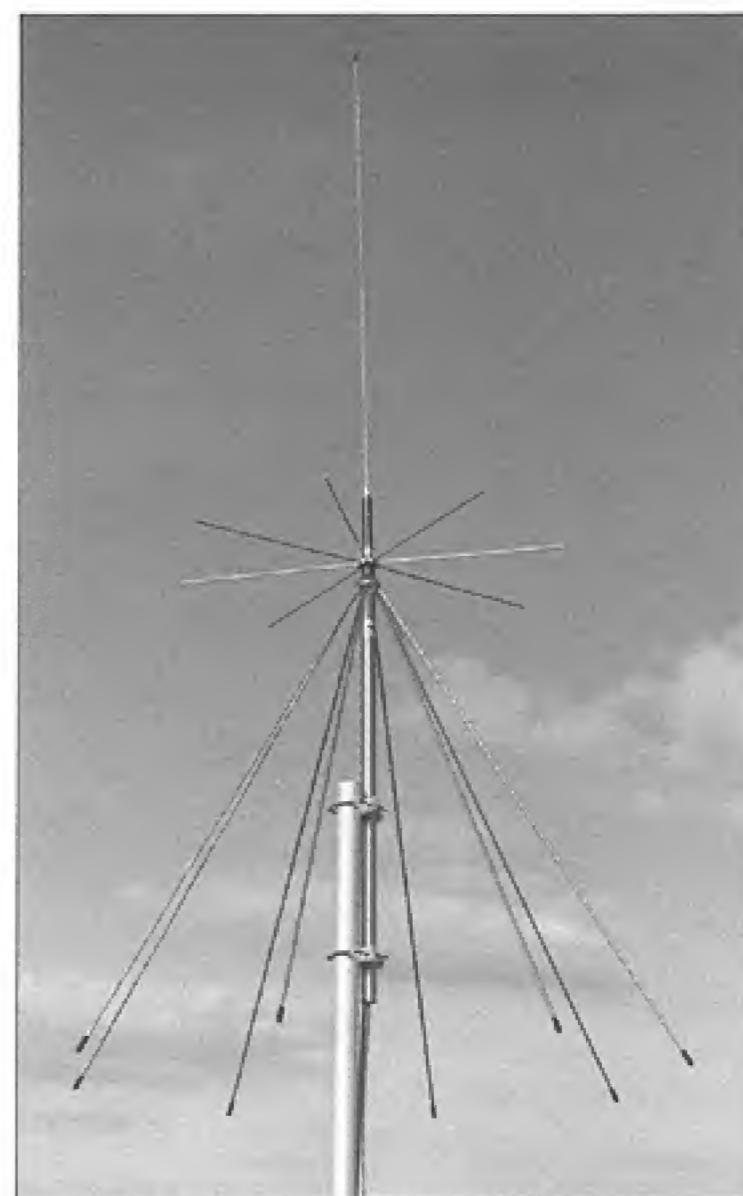
HS-15SB SWITCHBOX



SP-8 EXTERNAL MOBILE SPEAKER



AH-7000 SUPER WIDEBAND OMNIDIRECTIONAL ANTENNA



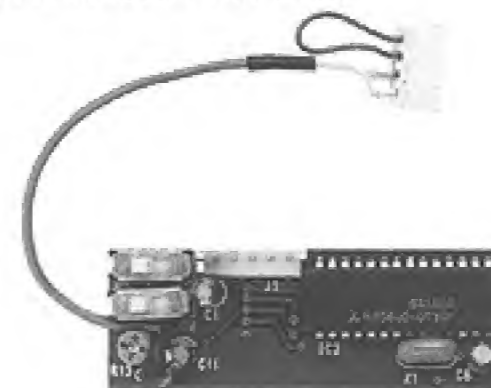
• SPECIFICATIONS

Frequency coverage: Receive 25 to 1300MHz
Transmit 50, 144, 430,
900, 1200MHz
bands

NOTE: The antenna connector supplied with the AH-7000 is a Type-N connector. This connector must be changed when using the AH-7000 with the IC-3200A/E. See your ICOM dealer for connector information.

UT-23 VOICE SYNTHESIZER UNIT

See page
12-2 for
installation
instructions.



■ OPTIONAL UT-23 VOICE SYNTHESIZER UNIT

The optional UT-23 VOICE SYNTHESIZER UNIT can be used with the IC-3200A/E. Via an internal, electronically-generated voice, the UT-23 provides immediate operating frequency identification each time a new frequency is selected.

Carefully follow the installation instructions below before installing the UT-23.

INSTALLATION PROCEDURE

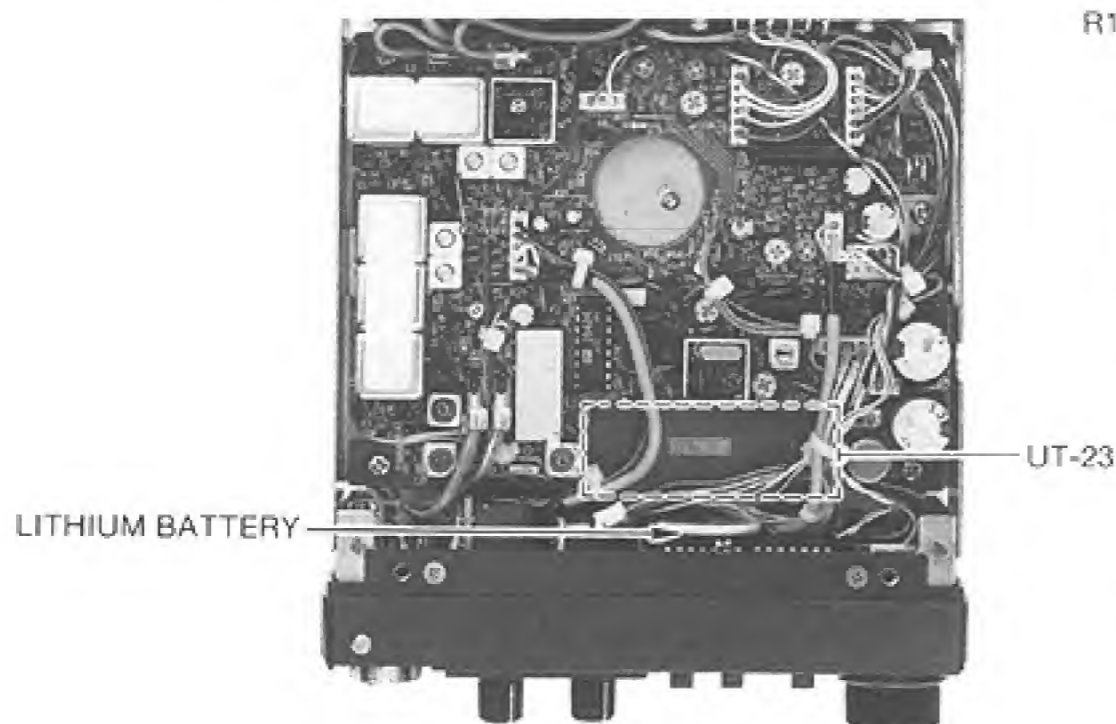
NOTE: Remove power cable before beginning installation.

1. Unscrew the four top screws and remove the top cover.
2. Unscrew the four bottom screws and remove the bottom cover.

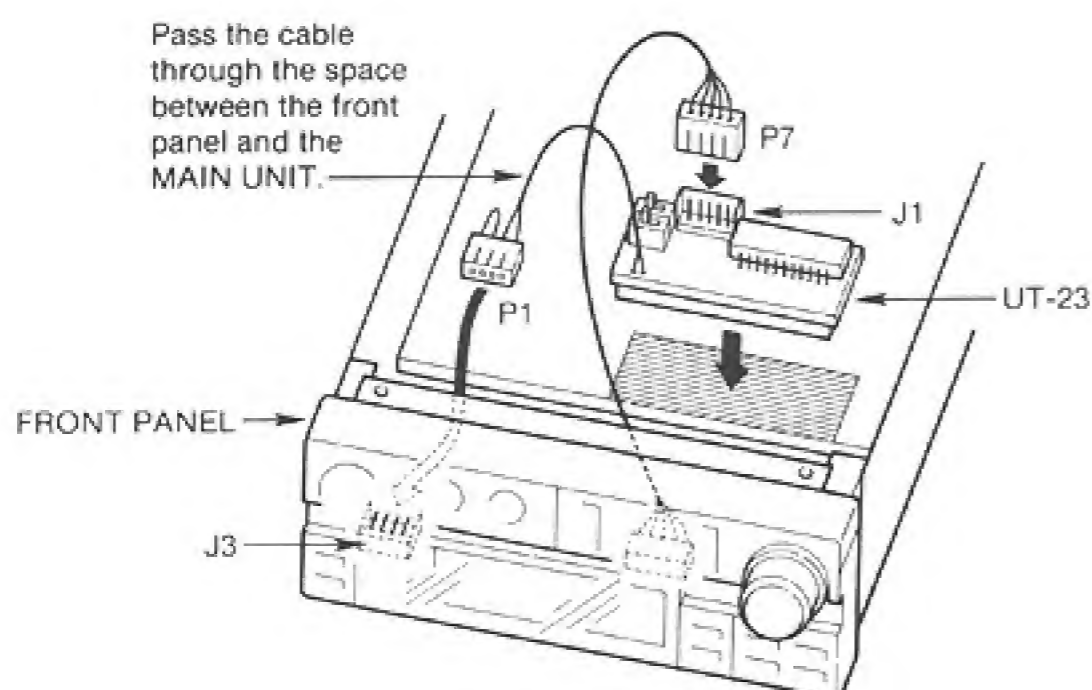
CAUTION: The speaker is mounted inside the bottom cover. Unplug the speaker plug from the circuit board as the bottom cover is removed.

3. Remove the protective paper from the back of the UT-23 to expose the adhesive strip, and install the unit in the location shown in the bottom view of the transceiver.

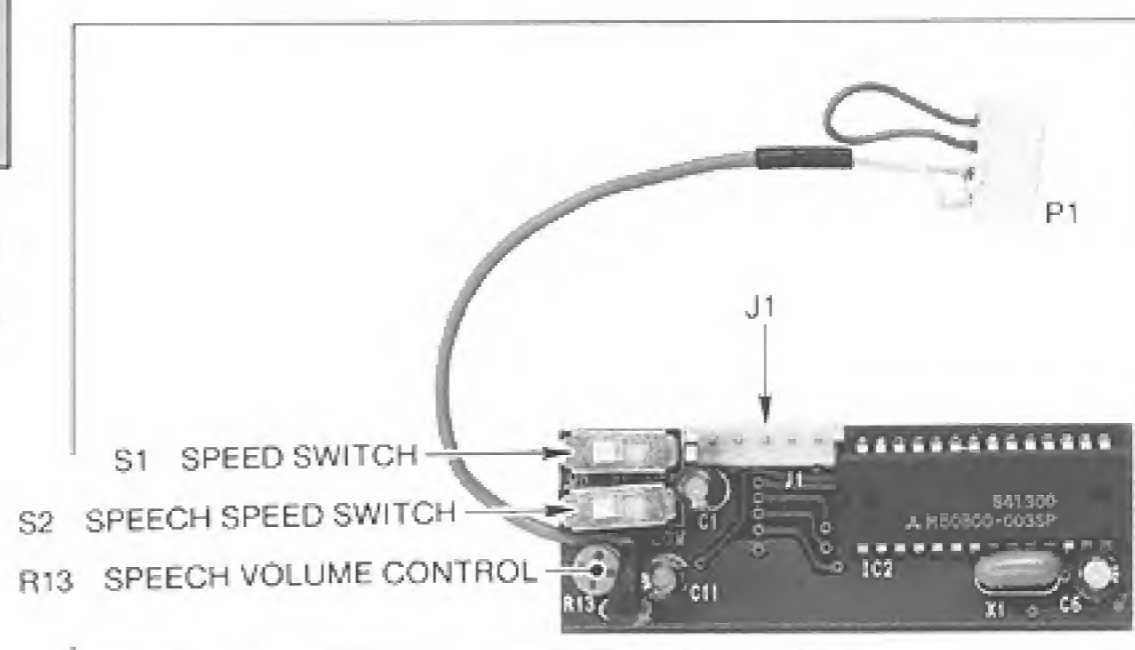
Bottom Side of Main Chassis
(MAIN UNIT side)



4. Insert the 5-pin plug (P7) from the transceiver into the connector (J1) mounted on the UT-23.



5. Insert the 4-pin plug (P1) from the UT-23 into the connector (J3) mounted on the LOGIC B UNIT.
6. Reset the transceiver CPU by the following method:
 - a) Press and hold the FUNCTION (F) SWITCH on the front panel.
 - b) Turn on the transceiver.
 - c) Release the FUNCTION (F) SWITCH, and push the switch again to turn out the FUNCTION INDICATOR.
7. The UT-23 is now installed and ready for use.



OPERATION

1. There are three controls mounted on the UT-23. They are:
 - a) SPEECH SWITCH (ON/OFF) S1
 - b) SPEECH SPEED SWITCH (HIGH/LOW) S2
 - c) SPEECH VOLUME CONTROL R13
2. Slide S1 to the ON position.
3. Slide S2 to the HIGH position for rapid speech or to the LOW position for slower speech.
4. Turn on the transceiver.
5. Operate the voice synthesizer by changing the receive frequency of the transceiver. The UT-23 automatically announces the new frequency as in the example below:

| Announcement | Transceiver Display |
|---------------------------------|---------------------|
| "One Four Five Point Six Eight" | |

6. Adjust R13 for a suitable speech level for your surroundings. The front panel VOLUME CONTROL also varies the voice synthesizer level.

SECTION 13 PARTS LIST

EF (VOL AND SQL) UNITS

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------------|
| R1 | Variable | K0911100M-5R1111-10KA |
| R2 | Variable | K09142007-5R2322-10KB |
| J1 | Connector | TLB-P05H-B1 |
| J2 | Connector | TLB-P05H-B1 |
| P1 | Connector | EHR-02 |
| P2 | Connector | EHR-03 |
| P3 | Connector | EHR-05 |
| P4 | Connector | EHR-03 |
| SP1 | Speaker | C060A20A0000 |
| EP1 | VOL P.C.B | B-948A |
| EP2 | SQL P.C.B | B-949A |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------|
| IC1 | IC | TK10420 |
| IC2 | IC | M5218L |
| IC3 | IC | μ PC577H |
| IC4 | IC | AN6541 |
| IC5 | IC | μ PC2002H |
| Q1 | FET | 3SK121-Y |
| Q2 | FET | 3SK121-Y |
| Q3 | Transistor | 2SC3399 |
| Q4 | Transistor | 2SC2668-O |
| Q5 | FET | 3SK121-Y |
| Q6 | FET | 2SK125 |
| Q7 | FET | 3SK97-Q2 |
| Q8 | Transistor | 2SC3399 |
| Q9 | Transistor | 2SC2458-GR |
| Q10 | Transistor | 2SC2458-GR |
| Q11 | Transistor | 2SC2458-GR |
| Q12 | Transistor | 2SC3399 |
| Q13 | Transistor | 2SC2458-GR |
| Q14 | Transistor | 2SB909-MR |
| Q15 | Transistor | 2SC2458-GR |
| D1 | Diode | 1SS53 |
| D2 | Diode | 1SS53 |
| D3 | Diode | 1SS53 |
| D4 | Diode | 1SS53 |
| D5 | Diode | 1SS53 |
| D6 | Diode | 1SS53 |
| D7 | Zener | RD6.2EB2 |
| D8 | Diode | 1SS53 |
| D9 | Diode | 1S953 |
| D10 | Diode | 1S953 |
| D11 | Diode | 1S953 |
| D12 | Diode | 1SS99 |
| D14 | Diode | 1SS53 |
| D15 | Diode | 1SS53 |
| D16 | Diode | 1SS53 |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|---------------|--------------------------|
| D17 | Diode | 1SS53 |
| D18 | Diode | 1SS53 |
| D19 | Diode | 1SS53 |
| D20 | Zener | RD4.7EB2 |
| D21 | Diode | 1SS53 |
| D22 | Diode | 1SS53 |
| D23 | Zener | RD6.8EB2 |
| D24 | Diode | 1S953 |
| D25 | Diode | 1SS133 |
| FI1 | Crystal | 30M15B |
| FI2 | Ceramic | CFW455E |
| X1 | Discriminator | CDB455C7A |
| X2 | Crystal | CR125 |
| L1 | Coil | LB-50 |
| L2 | Coil | LB-34A |
| L3 | Coil | LB-32A (#03, #04, #05) |
| L4 | Coil | LB-1-1A (#03, #04, #05) |
| L5 | Coil | LB-83 (#03, #04, #05) |
| L6 | Coil | LS-145 |
| L8 | Coil | LS-199 |
| L9 | Coil | LS-189 |
| L10 | Coil | LAL03NA-101K |
| L11 | Coil | LA-159 |
| L12 | Coil | LW-25 |
| L13 | Coil | 7HW-252MX-1550-A |
| L14 | Coil | LW-25 |
| L15 | Coil | 7HW-252MX-1550-A |
| L16 | Coil | LA-147 |
| L18 | Coil | LAL02NA-R22 |
| L20 | Coil | LS-121A |
| L22 | Coil | LW-15 |
| R1 | Resistor | 680 ELR20 |
| R2 | Resistor | 82 ELR20 (#03, #04, #05) |
| R3 | Resistor | 6.8k ELR20 |
| R4 | Resistor | 100 R20 |
| R5 | Resistor | 180 ELR20 |
| R8 | Resistor | 100 ELR20 |
| R9 | Resistor | 100 ELR20 |
| R10 | Resistor | 4.7k R20 |
| R11 | Resistor | 22k ELR20 |
| R12 | Resistor | 330 ELR20 |
| R13 | Resistor | 100 R20 |
| R14 | Resistor | 33k ELR20 |
| R15 | Resistor | 100k ELR20 |
| R16 | Resistor | 82 ELR20 |
| R17 | Resistor | 100 ELR20 |
| R18 | Resistor | 47 ELR20 |
| R19 | Resistor | 22 ELR20 |
| R20 | Resistor | 10k ELR20 |
| R21 | Resistor | 220 ELR20 |
| R24 | Resistor | 100 ELR20 |
| R25 | Resistor | 330 ELR20 |
| R26 | Thermistor | 33D28 |
| R27 | Resistor | 1.5k ELR20 |
| R28 | Resistor | 47k ELR20 |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------------------|
| R29 | Resistor | 1.5k ELR20 |
| R30 | Resistor | 1.5k ELR20 |
| R31 | Resistor | 4.7k R20 |
| R33 | Resistor | 1k R20 |
| R34 | Resistor | 1k ELR20 |
| R35 | Resistor | 47k ELR20 |
| R36 | Resistor | 47k ELR20 |
| R37 | Resistor | 22k ELR20 |
| R38 | Resistor | 18k ELR20 |
| R39 | Resistor | 47 ELR20 |
| R40 | Resistor | 470k ELR20 |
| R41 | Resistor | 560k ELR20 |
| R42 | Trimmer | 3.3k H0521A (#03, #04, #05) |
| R44 | Trimmer | 47k H0651A |
| R45 | Resistor | 10k ELR20 |
| R46 | Resistor | 2.2k ELR20 |
| R48 | Resistor | 10k ELR20 |
| R49 | Trimmer | 2.2k H0651A |
| R50 | Resistor | 2.2k R20 |
| R51 | Resistor | 330k ELR20 |
| R52 | Resistor | 5.6k ELR20 |
| R53 | Resistor | 22k R20 |
| R54 | Resistor | 10k R20 |
| R56 | Resistor | 15k R20 |
| R57 | Resistor | 150k ELR20 |
| R58 | Resistor | 39k R20 |
| R59 | Resistor | 4.7k ELR20 |
| R60 | Resistor | 1k R20 |
| R61 | Resistor | 4.7k ELR20 |
| R62 | Resistor | 5.6k ELR20 |
| R63 | Resistor | 47 R20 |
| R64 | Resistor | 15k ELR20 |
| R66 | Resistor | 5.6k R20 |
| R67 | Resistor | 100 ELR20 |
| R68 | Resistor | 1k R20 |
| R69 | Resistor | 1k ELR20 |
| R70 | Resistor | 47k ELR20 |
| R71 | Resistor | 47k ELR20 |
| R72 | Resistor | 22k ELR20 |
| R73 | Resistor | 20k ELR20 (#03, #04, #05) |
| R74 | Resistor | 820k ELR20 |
| R75 | Resistor | 560k ELR20 |
| R76 | Trimmer | 3.3k H0521A (#03, #04, #05) |
| R78 | Trimmer | 47k H0651A |
| R79 | Resistor | 22k R20 |
| R81 | Resistor | 4.7k R20 |
| R82 | Trimmer | 22k H0651A |
| R85 | Resistor | 100 ELR20 |
| R86 | Resistor | 15k ELR20 |
| R87 | Resistor | 47 ELR20 |
| R88 | Trimmer | 2.2k RHB0CJ30EA |
| R89 | Resistor | 0.75-J SRW1P |
| R90 | Resistor | 4.7k R20 |
| R91 | Resistor | 4.7k ELR20 |
| R92 | Resistor | 220 ELR20 |
| R93 | Resistor | 8.2 ELR20 |
| R96 | Resistor | 470k ELR20 |
| R97 | Resistor | 4.7k ELR20 |
| R98 | Resistor | 4.7k R20 |
| R99 | Resistor | 10k ELR20 |
| R100 | Resistor | 10k ELR20 |
| R101 | Resistor | 100 R20 |
| R102 | Resistor | 1k ELR20 |
| R103 | Resistor | 10k R20 |
| R104 | Resistor | 100 R20 |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|--------------|-------------------------|
| R105 | Trimmer | 1k H0521A |
| R106 | Resistor | 100 R50 |
| R107 | Resistor | 1.5k R20 |
| R108 | Resistor | 1k ELR20 |
| R109 | Resistor | 820 ELR20 |
| R110 | Resistor | 1k ELR20 |
| C1 | Ceramic | 18P 50V |
| C2 | Ceramic | 0.001 50V |
| C3 | Ceramic | 0.001 50V |
| C4 | Ceramic | 30P 50V (#03, #04, #05) |
| C6 | Ceramic | 0.001 50V |
| C7 | Ceramic | 10P 50V |
| C8 | Ceramic | 0.001 50V |
| C9 | Ceramic | 0.001 50V |
| C10 | Ceramic | 0.001 50V |
| C11 | Ceramic | 0.001 50V |
| C12 | Ceramic | 36P 50V |
| C13 | Ceramic | 1P 50V |
| C14 | Ceramic | 12P 50V |
| C15 | Ceramic | 120P 50V |
| C16 | Ceramic | 68P 50V |
| C17 | Ceramic | 0.0047 50V |
| C18 | Ceramic | 0.0047 50V |
| C19 | Ceramic | 0.001 50V |
| C20 | Ceramic | 12P 50V |
| C21 | Trimmer | ECRGA006A30 |
| C22 | Ceramic | 3P 50V |
| C23 | Ceramic | 0.001 50V |
| C24 | Ceramic | 0.001 50V |
| C25 | Ceramic | 0.001 50V |
| C26 | Ceramic | 0.001 50V |
| C27 | Ceramic | 0.001 50V |
| C28 | Ceramic | 3P 50V |
| C29 | Ceramic | 22P 50V |
| C30 | Ceramic | 22P 50V |
| C31 | Ceramic | 0.001 50V |
| C32 | Ceramic | 0.001 50V |
| C33 | Ceramic | 22P 50V |
| C34 | Ceramic | 3P 50V |
| C35 | Ceramic | 47P 50V |
| C36 | Trimmer | ECRGA006A30 |
| C37 | Ceramic | 12P 50V |
| C38 | Ceramic | 0.001 50V |
| C39 | Ceramic | 0.001 50V |
| C40 | Electrolytic | 47 16V |
| C41 | Ceramic | 0.0047 50V |
| C42 | Ceramic | 82P 50V |
| C43 | Tantalum | 0.1 35V |
| C44 | Barrier Lay | 0.1 16V |
| C45 | Ceramic | 10P 50V |
| C46 | Ceramic | 0.01 50V B |
| C47 | Ceramic | 47P 50V |
| C48 | Ceramic | 150P 50V |
| C49 | Ceramic | 36P 50V |
| C51 | Ceramic | 0.001 50V |
| C52 | Ceramic | 0.001 50V |
| C53 | Ceramic | 0.001 50V |
| C54 | Ceramic | 0.001 50V |
| C55 | Ceramic | 470P 50V |
| C56 | Ceramic | 470P 50V |
| C57 | Ceramic | 0.001 50V |
| C58 | Ceramic | 0.001 50V |
| C59 | Ceramic | 0.001 50V |
| C60 | Ceramic | 0.001 50V |
| C61 | Tantalum | 1 35V |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|-----------------|----------|
| C62 | Ceramic | 0.001 | 50V |
| C63 | Barrier Lay | 0.1 | 16V |
| C64 | Barrier Lay | 0.1 | 16V |
| C65 | Barrier Lay | 0.1 | 16V |
| C66 | Ceramic | 10P | 50V |
| C67 | Barrier Lay | 0.1 | 16V |
| C68 | Ceramic | 0.001 | 50V |
| C69 | Ceramic | 0.001 | 50V |
| C70 | Ceramic | 0.001 | 50V |
| C71 | Ceramic | 33P | 50V |
| C72 | Barrier Lay | TBD05X103M | 25V |
| C73 | Electrolytic | 2.2 | 50V MS7 |
| C74 | Electrolytic | 10 | 16V MS7 |
| C75 | Ceramic | 0.0047 | 50V |
| C76 | Barrier Lay | 0.033 | 25V |
| C77 | Electrolytic | 4.7 | 25V MS7 |
| C78 | Electrolytic | 47 | 16V MS7 |
| C79 | Barrier Lay | TBD05X103M | 25V |
| C80 | Tantalum | 0.022 | 50 F2Z |
| C81 | Barrier Lay | TBD05X103M | 25V |
| C82 | Ceramic | 0.001 | 50V |
| C83 | Ceramic | 0.001 | 50V |
| C84 | Ceramic | 0.001 | 50V |
| C85 | Ceramic | 0.001 | 50V |
| C86 | Ceramic | 470P | 50V |
| C87 | Ceramic | 470P | 50V |
| C88 | Ceramic | 0.001 | 50V |
| C89 | Ceramic | 0.001 | 50V |
| C90 | Ceramic | 0.001 | 50V |
| C91 | Electrolytic | 1000 | 16V MS16 |
| C92 | Electrolytic | 1000 | 16V MS16 |
| C93 | Tantalum | 1 | 35V |
| C94 | Tantalum | 10 | 16V |
| C95 | Electrolytic | 47 | 16V MS7 |
| C96 | Ceramic | 0.001 | 50V |
| C98 | Barrier Lay | TBD05X103M | 25V |
| C99 | Electrolytic | 220 | 10V |
| C100 | Electrolytic | 100 | 10V |
| C101 | Ceramic | 0.001 | 50V |
| C102 | Ceramic | 0.001 | 50V |
| C103 | Ceramic | 0.001 | 50V |
| C104 | Ceramic | 0.001 | 50V |
| C105 | Ceramic | 0.001 | 50V |
| C106 | Ceramic | 0.001 | 50V |
| C107 | Ceramic | 0.001 | 50V |
| C108 | Ceramic | 0.001 | 50V |
| C109 | Ceramic | 0.001 | 50V |
| C110 | Ceramic | 0.001 | 50V |
| C111 | Ceramic | 0.001 | 50V |
| C112 | Ceramic | 0.001 | 50V |
| C113 | Ceramic | 0.001 | 50V |
| C114 | Ceramic | 0.001 | 50V |
| C115 | Ceramic | 0.001 | 50V |
| C116 | Ceramic | 0.001 | 50V |
| C117 | Ceramic | 0.0047 | 50V |
| C118 | Tantalum | 1 | 35V |
| C119 | Barrier Lay | 0.1 | 16V |
| C120 | Ceramic | 150P | 50V |
| C121 | Ceramic | 0.001 | 50V |
| J1 | Mini pin | TMP-J01X-A2 | |
| J2 | Mini pin | TMP-J01X-A2 | |
| J3 | Mini pin | TMP-J01X-A2 | |
| J4 | Mini pin | TMP-J01X-A2 | |
| J5 | Connector | B06B-EH-S | |

MAIN UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|---------------------|
| J6 | Connector | B06B-EH-S |
| J7 | Connector | B03B-EH-S |
| J8 | Connector | B05B-EH-S |
| J9 | Connector | B03B-EH-S |
| J10 | Connector | B03B-EH-S |
| J11 | Connector | B03B-EH-S |
| J12 | Connector | B05B-EH-S |
| J13 | Connector | B02B-EH-S |
| J14 | Connector | B02B-EH-S |
| J15 | Connector | IMSA-9201B-1-02-T |
| J16 | Connector | B03B-EH-S |
| P1 | Connector | EHR-08 |
| EP1 | MAIN P.C.B | B-943G |
| EP2 | Bead Core | BT01RNI-A61 |
| *EP5 | Insulator | 40639 (10mm x 10mm) |
| *EP6 | Insulator | 41629 (29mm x 25mm) |
| W18 | Jumper | IPS-1041-2 |
| W19 | Jumper | IPS-1041-2 |
| W20 | Jumper | IPS-1041-2 |
| W21 | Jumper | IPS-1041-2 |
| W22 | Jumper | IPS-1041-4 |
| W23 | Jumper | IPS-1041-2 |
| W24 | Jumper | IPS-1041-4 |
| W25 | Jumper | IPS-1041-2 |
| W27 | Jumper | IPS-1041-4 |
| W28 | Jumper | IPS-1041-2 |
| W29 | Jumper | IPS-1041-4 |
| W30 | Jumper | IPS-1041-2 |
| W31 | Jumper | IPS-1041-2 |
| W32 | Jumper | IPS-1041-2 |
| W33 | Jumper | IPS-1041-2 |
| W34 | Jumper | IPS-1041-2 |
| W35 | Jumper | IPS-1041-2 |
| W36 | Jumper | IPS-1041-4 |
| W37 | Jumper | IPS-1041-4 |
| W38 | Jumper | IPS-1041-4 |
| W39 | Jumper | IPS-1041-4 |
| W40 | Jumper | IPS-1041-4 |

*Located under the MAIN BOARD.

RX VCO UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------|
| Q1 | FET | 2SK125 |
| Q2 | Transistor | 2SC3399 |
| Q3 | Transistor | 2SC3399 |
| Q4 | FET | 2SK125 |
| Q5 | Transistor | 2SC2026 |
| D1 | Varicap | 1T25 |
| D2 | Varicap | 1T25 |
| L1 | Coil | LAL03NA-4R7 |
| L2 | Coil | LAL03NA-R39 |
| L3 | Coil | LA-188 |
| L4 | Coil | LAL03NA-4R7 |
| L5 | Coil | LAL03NA-R39 |
| L6 | Coil | LAL03NA-4R7 |
| L7 | Coil | LAL03NA-R39 |
| L8 | Coil | LB-166 |

RX VCO UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|-----------------|--------|
| R1 | Resistor | 47 | ELR20 |
| R2 | Resistor | 330 | ELR20 |
| R4 | Resistor | 330 | ELR20 |
| R5 | Resistor | 270 | ELR20 |
| R6 | Resistor | 100 | R20 |
| R7 | Resistor | 6.8k | ELR20 |
| R8 | Resistor | 1k | ELR20 |
| R9 | Resistor | 100 | ELR20 |
| C1 | Ceramic | 33P | 50V XL |
| C2 | Ceramic | 2P | 50V CH |
| C5 | Ceramic | 15P | 50V |
| C6 | Ceramic | 8P | 50V |
| C11 | Ceramic | 0.35P | 50V |
| C12 | Ceramic | 47P | 50V |
| C13 | Ceramic | 8P | 50V |
| C14 | Ceramic | 12P | 50V |
| C15 | Ceramic | 5P | 50V CH |
| C16 | Trimmer | ECR-GA003A30 | |
| C17 | Ceramic | 12P | 50V UJ |
| C20 | Ceramic | 470P | 50V |
| C21 | Ceramic | 0.5P | 50V |
| C22 | Ceramic | 10P | 50V |
| EP1 | RX VCO P.C.B | B-899E | |

TX VCO UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|-------------|-----------------|--------|
| Q1 | FET | 2SK125 | |
| Q2 | Transistor | 2SC2026 | |
| Q3 | Transistor | 2SC3399 | |
| Q4 | Transistor | 2SC3399 | |
| Q5 | Transistor | 2SC945K | |
| Q6 | FET | 2SK125 | |
| D1 | Varicap | 1T25 | |
| D2 | Varicap | 1T25 | |
| D3 | Varicap | 1T25 | |
| D4 | Varicap | 1T25 | |
| D5 | Diode | 1SS133 | |
| L1 | Coil | LAL03NA-R33 | |
| L2 | Coil | LA-188 | |
| L4 | Coil | LW-19 | |
| L5 | Coil | LA-233 | |
| L6 | Coil | LAL03NA-4R7 | |
| L7 | Coil | LB-141 | |
| L9 | Coil | LAL03NA-R82 | |
| L10 | Coil | LAL03NA-4R7 | |
| L11 | Coil | LAL03NA-R33 | |
| R1 | Resistor | 47 | ELR20 |
| R2 | Trimmer | 10k | H0521A |
| R3 | Trimmer | 10k | H0521A |
| R4 | Resistor | 5.6k | ELR20 |
| R5 | Resistor | 1k | ELR20 |
| R6 | Resistor | 47 | ELR20 |
| R7 | Resistor | 270 | ELR20 |
| R8 | Resistor | 100 | ELR20 |
| R9 | Resistor | 4.7k | ELR20 |

TX VCO UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|-----------------|----------------|
| R10 | Resistor | 330 | ELR20 |
| R11 | Resistor | 150 | ELR20 |
| R16 | Resistor | 33k | R20 |
| R17 | Resistor | 10k | R20 |
| R18 | Resistor | 47k | R20 |
| R19 | Resistor | 47k | ELR20 |
| R20 | Resistor | 10k | R25 |
| R21 | Resistor | 47k | R20 |
| R23 | Resistor | 22k | ELR20 |
| R24 | Resistor | 22k | R20 |
| C1 | Ceramic | 8P | 50V UJ |
| C2 | Trimmer | ECR-GA003A30 | |
| C3 | Ceramic | 2P | 50V CH |
| C4 | Ceramic | 0.75P | 50V |
| C6 | Ceramic | 8P | 50V |
| C7 | Ceramic | 1P | 50V |
| C8 | Ceramic | 47P | 50V |
| C9 | Ceramic | 0.001 | 50V |
| C10 | Ceramic | 47P | 50V |
| C12 | Ceramic | 15P | 50V |
| C13 | Ceramic | 47P | 50V |
| C14 | Ceramic | 0.001 | 50V |
| C15 | Ceramic | 470P | 50V |
| C16 | Electrolytic | 100 | 10V MS7 |
| C17 | Ceramic | 1P | 50V |
| C18 | Ceramic | 8P | 50V |
| C19 | Ceramic | 15P | 50V |
| C20 | Ceramic | 1P | 50V |
| C22 | Ceramic | 2P | 50V CH |
| C24 | Ceramic | 33P | 50V XL |
| C25 | Ceramic | 8P | 50V |
| C27 | Feed Through | TF240-602-332 | |
| C28 | Feed Through | TF240-602-332 | |
| C29 | Feed Through | TF240-602-332 | |
| C30 | Ceramic | 47P | 50V |
| C31 | Ceramic | 47P | 50V |
| C32 | Ceramic | 470P | 50V |
| C33 | Ceramic | 47P | 50V |
| C34 | Cylinder | UP125SL010M-NA | |
| C35 | Tantalum | 0.1 | 35V (#04, #05) |
| C35 | Tantalum | 0.47 | 35V (#03) |
| C36 | Ceramic | 47P | 50V |
| EP1 | TX VCO P.C.B | B-900E | |
| EP2 | Pin | RT-01T-1.0B | |
| W1 | Jumper | IPS-1041-2 | |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-------------------|
| IC1 | IC | μPD2834C |
| IC2 | IC | μPB571C |
| IC3 | IC | TC4555BP |
| IC4 | IC | M54519 |
| IC5 | IC | NJM4558D |
| IC6 | IC | TA78L006AP |
| IC7 | IC | TC4094BP (#03) |
| IC8 | IC | S7116A (#03, #04) |
| IC9 | IC | μPD4066BC |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------------------|
| Q1 | Transistor | 2SC2458-Y |
| Q2 | Transistor | 2SC2458L-GR |
| Q3 | Transistor | 2SC2458L-GR |
| Q4 | Transistor | 2SA1048-Y |
| Q5 | Transistor | 2SC3399 |
| Q6 | Transistor | 2SC2026 |
| Q7 | Transistor | 2SC2026 |
| Q8 | Transistor | 2SC1571-G |
| Q9 | Transistor | 2SB909M-R |
| Q10 | Transistor | 2SB909M-R |
| Q11 | Transistor | 2SB909M-R |
| Q12 | Transistor | 2SB909M-R |
| Q13 | Transistor | 2SB909M-R |
| Q14 | Transistor | 2SB909M-R |
| Q15 | Transistor | 2SC2026 |
| Q16 | Transistor | 2SC2026 |
| Q17 | Transistor | 2SC2407 (1) (#03, #04, #05) |
| Q18 | Transistor | 2SC2026 |
| Q19 | Transistor | 2SC2407A |
| Q21 | Transistor | 2SC3399 |
| Q22 | Transistor | 2SA1048-Y |
| Q23 | Transistor | 2SA1345 |
| Q24 | Transistor | 2SC3399 |
| D1 | Diode | 1SS133 |
| D2 | Diode | 1SS133 |
| D3 | Diode | 1SS133 |
| D4 | Diode | 1SS133 |
| D5 | Diode | 1SS133 |
| D6 | Diode | 1SS133 |
| D7 | Diode | 1SS133 |
| D8 | Diode | 1SS133 |
| D10 | Diode | 1SS133 |
| D11 | Diode | 1SS216 |
| D12 | Diode | 1SS216 |
| D13 | Diode | 1SS216 |
| D14 | Diode | 1SS133 |
| D15 | Diode | 1SS133 |
| X1 | Crystal | CR112 (#03, #05) |
| X1 | Crystal | CR113 (#04) |
| X2 | Crystal | 3.579545MHz (#03, #04) |
| L1 | Coil | LW-19 |
| L2 | Coil | LW-19 |
| L3 | Coil | LA-233 |
| L4 | Coil | LA-233 |
| L5 | Coil | LA-232 |
| L6 | Coil | LA-232 |
| L7 | Coil | LA-232 |
| L8 | Coil | LA-238 |
| L9 | Coil | LA-237 |
| L10 | Coil | LA-232 |
| L11 | Coil | LA-232 |
| L12 | Coil | LA-235 |
| L13 | Coil | LA-235 |
| R1 | Resistor | 5.6k ELR20 |
| R2 | Resistor | 220k ELR20 |
| R3 | Resistor | 100 R20 |
| R4 | Resistor | 10k R20 (#04, #05) |
| R4 | Resistor | 8.2k R20 (#03) |
| R5 | Resistor | 2.2k ELR20 |
| R6 | Resistor | 100 R20 (#04, #05) |
| R6 | Resistor | 1.5k R20 (# 03) |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|------------------------|
| R8 | Resistor | 47 ELR20 |
| R9 | Resistor | 1.5k R25 |
| R12 | Resistor | 10k ELR20 |
| R13 | Resistor | 100 R20 |
| R14 | Resistor | 1k ELR20 |
| R15 | Resistor | 4.7k R20 |
| R16 | Resistor | 4.7k ELR20 |
| R17 | Resistor | 4.7k R25 |
| R18 | Resistor | 10k ELR20 |
| R19 | Resistor | 1k R20 |
| R20 | Resistor | 100 R20 |
| R21 | Resistor | 5.6k ELR20 |
| R22 | Resistor | 100 R20 |
| R23 | Resistor | 100 R20 |
| R24 | Resistor | 5.6k ELR20 |
| R25 | Resistor | 1k ELR20 |
| R26 | Resistor | 47 ELR20 |
| R27 | Resistor | 100 ELR20 |
| R28 | Resistor | 1k R20 |
| R29 | Resistor | 10k R20 |
| R30 | Resistor | 1k ELR20 |
| R31 | Resistor | 10k ELR20 |
| R32 | Resistor | 1k R20 |
| R33 | Resistor | 10k R20 |
| R34 | Resistor | 1k ELR20 |
| R35 | Resistor | 10k ELR20 |
| R36 | Resistor | 1k R20 |
| R37 | Resistor | 10k R20 |
| R38 | Resistor | 1k ELR20 |
| R39 | Resistor | 10k R20 |
| R42 | Trimmer | 100k H0651A (#03, #04) |
| R43 | Trimmer | 100k H0651A (#03) |
| R44 | Resistor | 47k R20 (#03, #04) |
| R45 | Resistor | 82k ELR20 |
| R46 | Resistor | 82k R20 |
| R47 | Resistor | 390k ELR20 |
| R48 | Resistor | 270k ELR20 |
| R49 | Resistor | 150k R20 |
| R50 | Trimmer | 100k H0651A |
| R51 | Resistor | 1.5k ELR20 |
| R52 | Resistor | 100 R20 |
| R53 | Resistor | 220k R20 |
| R54 | Resistor | 270k ELR20 |
| R55 | Resistor | 100 ELR20 |
| R56 | Resistor | 1.8k ELR20 |
| R58 | Resistor | 680k ELR20 |
| R59 | Resistor | 220 ELR20 |
| R60 | Resistor | 1k ELR20 |
| R61 | Resistor | 68 ELR20 |
| R62 | Resistor | 47 ELR20 |
| R65 | Resistor | 1k ELR20 |
| R66 | Resistor | 100 R20 |
| R67 | Resistor | 4.7k R20 |
| R68 | Resistor | 1k ELR20 |
| R69 | Resistor | 150 ELR20 |
| R70 | Resistor | 47 R50 (#03, #04, #05) |
| R71 | Resistor | 2.2k R20 |
| R72 | Resistor | 5.6k ELR20 |
| R73 | Resistor | 1k ELR20 |
| R74 | Resistor | 100 ELR20 |
| R75 | Resistor | 100 R20 |
| R76 | Resistor | 150 ELR20 |
| R77 | Resistor | 1k ELR20 |
| R78 | Resistor | 4.7k R20 |
| R79 | Resistor | 2.2k ELR20 |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|------------------|--------------------|
| R80 | Resistor | 18 | ELR20 |
| R81 | Resistor | 270 | ELR20 |
| R82 | Resistor | 270 | ELR20 |
| R83 | Resistor | 2.2k | R20 |
| R84 | Resistor | 1k | R20 |
| R85 | Resistor | 100 | ELR20 |
| R86 | Resistor | 68 | ELR20 |
| R87 | Resistor | 100 | ELR20 |
| R89 | Resistor | 220k | ELR20 |
| R90 | Resistor | 100 | R20 |
| R91 | Resistor | 100k | R20 |
| R92 | Resistor | 100k | ELR20 |
| R93 | Resistor | 82k | ELR20 |
| R94 | Resistor | 10k | R20 |
| R95 | Resistor | 2.7k | ELR20 (#04, #05) |
| R95 | Resistor | 1.8k | ELR20 (#03) |
| R96 | Resistor | 22k | ELR20 (#04, #05) |
| R97 | Resistor | 2.2k | R20 (#04, #05) |
| R97 | Resistor | 22k | R20 (#03) |
| R98 | Resistor | 47k | ELR20 |
| R99 | Resistor | 100 | R25 |
| R100 | Resistor | 33k | R25 (#03, #04) |
| R101 | Resistor | 47 | ELR20 |
| R103 | Resistor | 1k | ELR20 |
| R104 | Resistor | 10k | R20 |
| R105 | Resistor | 6.8k | R20 |
| R106 | Resistor | 39k | R20 (#04) |
| | | | |
| C1 | Ceramic | 100P | 50V |
| C2 | Ceramic | 200P | 50V |
| C3 | Barrier Lay | TBD05X103M | |
| C4 | Ceramic | 18P | 50V CH |
| C5 | Trimmer | CV05C1201 | |
| C6 | Cylinder | UP125-B-102K-NA | |
| C7 | Electrolytic | 470 | 6.3V MS9 |
| C8 | Ceramic | 0.001 | 50V |
| C9 | Ceramic | 47P | 50V |
| C10 | Ceramic | 47P | 50V |
| C11 | Ceramic | 47P | 50V |
| C12 | Ceramic | 47P | 50V |
| C13 | Cylinder | UP125-SL-101J-NA | |
| C14 | Electrolytic | 0.47 | 50V MS7 |
| C15 | Electrolytic | 10 | 16V MS7 |
| C16 | Ceramic | 10P | 50V |
| C17 | Barrier Lay | 0.1 | 16V |
| C18 | Electrolytic | 470 | 10V MS9 |
| C20 | Ceramic | 0.001 | 50V |
| C21 | Electrolytic | 10 | 16V BP |
| C24 | Ceramic | 5P | 50V |
| C25 | Ceramic | 0.0047 | 50V |
| C26 | Ceramic | 470P | 50V |
| C27 | Ceramic | 0.001 | 50V |
| C28 | Ceramic | 0.001 | 50V |
| C29 | Ceramic | 0.001 | 50V |
| C30 | Ceramic | 18P | 50V |
| C31 | Ceramic | 470P | 50V |
| C32 | Tantalum | 0.1 | 35V |
| C34 | Ceramic | 0.001 | 50V |
| C35 | Ceramic | 470P | 50V |
| C36 | Ceramic | 470P | 50V |
| C37 | Ceramic | 47P | 50V |
| C38 | Ceramic | 0.001 | 50V |
| C39 | Ceramic | 0.001 | 50V |
| C40 | Ceramic | 0.001 | 50V |
| C41 | Electrolytic | 1 | 50V MS7 (#03, #04) |
| C42 | Ceramic | 47P | 50V |
| C43 | Ceramic | 47P | 50V |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|-----------------|---------------------|
| C44 | Ceramic | 47P | 50V |
| C45 | Ceramic | 47P | 50V |
| C46 | Ceramic | 47P | 50V |
| C49 | Ceramic | 33P | 50V (#03, #04) |
| C50 | Ceramic | 33P | 50V (#03, #04) |
| C51 | Ceramic | 120P | 50V |
| C52 | Mylar | 0.0022 | 50F2Z |
| C53 | Ceramic | 0.001 | 50V |
| C54 | Electrolytic | 0.22 | 50V MS7 |
| C55 | Ceramic | 0.001 | 50V |
| C56 | Ceramic | 0.001 | 50V |
| C57 | Barrier Lay | TBD05X103M | 25V |
| C58 | Ceramic | 0.001 | 50V |
| C59 | Electrolytic | 100 | 10V MS7 |
| C60 | Electrolytic | 0.47 | 50V BP |
| C61 | Ceramic | 0.001 | 50V |
| C62 | Electrolytic | 100 | 10V MS9 |
| C63 | Ceramic | 3P | 50V |
| C64 | Ceramic | 0.001 | 50V |
| C65 | Ceramic | 0.001 | 50V |
| C66 | Ceramic | 47P | 50V |
| C67 | Ceramic | 6P | 50V |
| C69 | Ceramic | 0.001 | 50V |
| C70 | Ceramic | 0.001 | 50V |
| C71 | Ceramic | 0.001 | 50V |
| C72 | Ceramic | 0.001 | 50V |
| C73 | Trimmer | CV05E0601 | (#03, #04, #05) |
| C74 | Ceramic | 1P | 50V |
| C75 | Ceramic | 470P | 50V |
| C76 | Ceramic | 470P | 50V |
| C77 | Ceramic | 0.001 | 50V |
| C78 | Ceramic | 12P | 50V (#03, #04, #05) |
| C79 | Ceramic | 470P | 50V |
| C80 | Ceramic | 0.001 | 50V |
| C81 | Ceramic | 10P | 50V |
| C82 | Ceramic | 0.001 | 50V |
| C83 | Ceramic | 0.001 | 50V |
| C84 | Ceramic | 470P | 50V |
| C85 | Ceramic | 15P | 50V |
| C86 | Ceramic | 470P | 50V |
| C87 | Ceramic | 470P | 50V |
| C88 | Ceramic | 470P | 50V |
| C89 | Ceramic | 22P | 50V |
| C90 | Ceramic | 10P | 50V |
| C91 | Ceramic | 0.001 | 50V |
| C92 | Ceramic | 470P | 50V |
| C93 | Ceramic | 39P | 50V |
| C94 | Ceramic | 8P | 50V |
| C95 | Ceramic | 6P | 50V |
| C96 | Ceramic | 8P | 50V |
| C97 | Ceramic | 10P | 50V |
| C98 | Ceramic | 47P | 50V |
| C99 | Ceramic | 15P | 50V |
| C100 | Ceramic | 39P | 50V |
| C101 | Ceramic | 39P | 50V |
| C102 | Ceramic | 470P | 50V |
| C103 | Ceramic | 47P | 50V |
| C104 | Ceramic | 0.001 | 50V |
| C105 | Ceramic | 470P | 50V |
| C106 | Ceramic | 15P | 50V |
| C107 | Ceramic | 2P | 50V |
| C108 | Electrolytic | 0.47 | 50V MS7 (#03, #04) |
| C109 | Electrolytic | 0.47 | 50V MS7 (#03) |
| C110 | Electrolytic | 1 | 50V BP |
| C111 | Barrier Lay | TBD05X103M | 25V |
| C113 | Barrier Lay | 0.047 | 25V (#04, #05) |
| C114 | Electrolytic | 10 | 16V MS7 (#04, #05) |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|---------------|-----------------------|
| C114 | Electrolytic | 1 50V MS7 (#03) |
| C115 | Barrier Lay | TBD05X103M 25V (#03) |
| C118 | Electrolytic | 1000 10V 12.5 x 12.5 |
| C119 | Ceramic | 0.001 50V |
| C120 | Ceramic | 0.001 50V |
| C121 | Ceramic | 0.001 50V |
| C122 | Ceramic | 0.001 50V |
| C123 | Ceramic | 0.001 50V |
| C124 | Ceramic | 0.001 50V |
| C126 | Tantalum | 0.1 35V |
| C127 | Electrolytic | 100 16V |
| C128 | Ceramic | 0.001 50V |
| C129 | Ceramic | 470P 50V |
| C130 | Ceramic | 0.001 50V |
| C131 | Ceramic | 0.001 50V |
| C132 | Ceramic | 0.001 50V |
| C133 | Ceramic | 0.001 50V |
| C134 | Ceramic | 47P 50V |
| C135 | Ceramic | 47P 50V |
| C136 | Ceramic | 47P 50V |
| C137 | Ceramic | 47P 50V |
| C138 | Ceramic | 47P 50V |
| C139 | Ceramic | 47P 50V |
| C140 | Barrier Lay | 0.0047 25V |
| C142 | Tantalum | 0.1 35V |
| C143 | Barrier Lay | TBD05X103M 25V |
| C144 | Ceramic | 12P 50V |
| C145 | Tantalum | 2.2 35V |
| J1 | Mini pin | TMP-J01X-A2 |
| J2 | Mini pin | TMP-J01X-A2 |
| J3 | Connector | B02B-EH-S |
| J4 | Connector | B08B-EH-S |
| J5 | Connector | B06B-EH-S |
| J6 | Connector | B04B-EH-S |
| J8 | Connector | B03B-EH-S (#04) |
| P1 | Connector | TMP-P01X-A1 |
| P2 | Connector | TMP-P01X-A1 |
| EP1 | PLL-YGR P.C.B | B-898F |
| EP2 | Insulator | J-40639 |
| W9 | Jumper | JPW-02A |
| W10 | Jumper | JPW-02A |
| W11 | Jumper | JPW-02A |
| W12 | Jumper | IPS-1041-2 |
| W13 | Jumper | IPS-1041-2 |
| W14 | Jumper | IPS-1041-2 |
| W15 | Jumper | IPS-1041-2 |
| W16 | Jumper | IPS-1041-2 |
| W17 | Jumper | IPS-1041-2 |
| W18 | Jumper | IPS-1041-2 |
| W19 | Jumper | IPS-1041-2 |
| W20 | Jumper | IPS-1041-2 |
| W21 | Jumper | IPS-1041-2 |
| W22 | Jumper | IPS-1041-2 |
| W23 | Jumper | IPS-1041-2 |
| W24 | Jumper | IPS-1041-2 |
| W25 | Jumper | IPS-1041-2 (#03, #05) |
| W26 | Jumper | IPS-1041-2 (#03) |
| W27 | Jumper | IPS-1041-2 (#03) |
| W28 | Jumper | IPS-1041-2 (#03) |
| W29 | Jumper | IPS-1041-2 |
| W30 | Jumper | IPS-1041-2 (#03, #04) |

PLL-YGR UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------------|
| W31 | Jumper | IPS-1041-2 (#03) |
| W32 | Jumper | IPS-1041-2 |
| W33 | Jumper | IPS-1041-2 |
| W34 | Jumper | IPS-1041-2 |
| W35 | Jumper | IPS-1041-2 |
| W36 | Jumper | IPS-1041-2 |
| W37 | Jumper | IPS-1041-2 |
| W38 | Jumper | IPS-1041-2 |
| W40 | Jumper | IPS-1041-2 |
| W41 | Jumper | IPS-1041-4 |
| W42 | Jumper | IPS-1041-4 |
| W43 | Jumper | IPS-1041-4 |
| W44 | Jumper | IPS-1041-4 |
| W45 | Jumper | JPW-02A |
| W46 | Jumper | IPS-1041-4 |
| W48 | Jumper | IPS-1041-4 |
| W49 | Jumper | IPS-1041-4 (#03) |
| W51 | Jumper | IPS-1041-4 (#03) |
| W52 | Jumper | IPS-1041-4 |
| W53 | Jumper | IPS-1041-4 |
| W54 | Jumper | IPS-1041-4 |
| W55 | Jumper | IPS-1041-4 |
| W56 | Jumper | IPS-1041-4 |
| W57 | Jumper | IPS-1041-4 |
| W58 | Jumper | IPS-1041-4 |
| W59 | Jumper | IPS-1041-4 |
| W61 | Jumper | IPS-1041-4 (#03, #04) |
| W62 | Jumper | IPS-1041-4 |
| W63 | Jumper | IPS-1041-4 (#03) |
| W64 | Jumper | IPS-1041-4 |
| W65 | Jumper | IPS-1041-4 |
| W66 | Jumper | IPS-1041-4 |
| W67 | Jumper | IPS-1041-4 |
| W68 | Jumper | IPS-1041-4 |
| W69 | Jumper | IPS-1041-4 |
| W70 | Jumper | IPS-1041-4 |
| W71 | Jumper | IPS-1041-4 |
| W75 | Jumper | JPW-02A (#04) |
| W78 | Jumper | JPW-02A (#04) |
| W79 | Jumper | IPS-1041-2 (#04) |
| W80 | Jumper | IPS-1041-2 (#04) |
| W81 | Jumper | IPS-1041-2 (#04) |
| W82 | Jumper | IPS-1041-2 (#04) |
| W83 | Jumper | IPS-1041-2 (#04) |

LOGIC A UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------|
| IC1 | IC | μPD7514G-046-12 |
| IC2 | IC | μPD4081BG |
| IC3 | IC | μPD4081BG |
| IC4 | IC | μPD4050BG |
| IC5 | IC | LA6393M |
| Q1 | Transistor | 2SC3395 |
| Q2 | Transistor | 2SC3395 |
| Q3 | Transistor | 2SC3395 |
| Q4 | Transistor | 2SC2712-Y |
| Q5 | Transistor | 2SC3395 |
| Q6 | Transistor | 2SC3395 |
| Q7 | Transistor | 2SC3395 |
| Q8 | Transistor | 2SC3395 |
| D1 | Diode | 1SS184 |

LOGIC A UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|-------------|-----------------|----------|
| D2 | Diode | 1SS193 | |
| D3 | Diode | 1SS193 | |
| D5 | Diode | 1SS184 | |
| D6 | Diode | 1SS187 | |
| D7 | Diode | 1SS193 | |
| D8 | Diode | 1SS181 | |
| D9 | Diode | 1SS193 | |
| D10 | Diode | 1SS193 | |
| D11 | LED | SLP451B | |
| D12 | LED | LN233RP | |
| D13 | LED | LN333GP | |
| D14 | Zener | RD5.6MB2 | |
| R1 | Resistor | 82k | MCR10 |
| R2 | Resistor | 82k | MCR10 |
| R3 | Resistor | 47k | MCR10 |
| R4 | Resistor | 47k | MCR10 |
| R5 | Resistor | 100k | MCR10 |
| R6 | Resistor | 220k | MCR10 |
| R9 | Resistor | 12k | MCR10 |
| R10 | Resistor | 47k | MCR10 |
| R11 | Resistor | 820 | MCR10 |
| R13 | Resistor | 470 | MCR10 |
| R14 | Resistor | 470 | MCR10 |
| R15 | Resistor | 470 | MCR10 |
| R16 | Resistor | 47k | MCR10 |
| R17 | Resistor | 12k | MCR10 |
| R18 | Resistor | 1k | MCR10 |
| R19 | Resistor | 56k | MCR10 |
| R20 | Resistor | 22k | MCR10 |
| R21 | Resistor | 100k | MCR10 |
| R22 | Resistor | 47k | MCR10 |
| R23 | Resistor | 47k | MCR10 |
| R24 | Resistor | 10k | MCR10 |
| R25 | Resistor | 1M | MCR10 |
| R26 | Resistor | 12k | MCR10 |
| R27 | Resistor | 12k | MCR10 |
| R28 | Resistor | 220k | MCR10 |
| R29 | Resistor | 47k | MCR10 |
| R30 | Resistor | 47k | MCR10 |
| R31 | Resistor | 4.7k | MCR10 |
| R32 | Resistor | 47k | MCR10 |
| R33 | Resistor | 22k | R20 |
| R34 | Resistor | 47K | R20 |
| C1 | Monolithic | 0.001 | 50V GR40 |
| C2 | Monolithic | 33P | 50V GR40 |
| C3 | Monolithic | 0.001 | 50V GR40 |
| C4 | Monolithic | 0.001 | 50V GR40 |
| C5 | Monolithic | 0.001 | 50V GR40 |
| C6 | Monolithic | 0.001 | 50V GR40 |
| C8 | Monolithic | 0.1 | 25V GR40 |
| C11 | Monolithic | 0.001 | 50V GR40 |
| C13 | Monolithic | 0.001 | 50V GR40 |
| C14 | Monolithic | 0.001 | 50V GR40 |
| C16 | Monolithic | 0.001 | 50V GR40 |
| C17 | Monolithic | 0.001 | 50V GR40 |
| C18 | Monolithic | 0.1 | 25V GR40 |
| C19 | Monolithic | 0.01 | 25V GR40 |
| C20 | Monolithic | 0.01 | 25V GR40 |
| C21 | Monolithic | 33P | 50V GR40 |
| J1 | Connector | 8S-S-E | |

LOGIC A UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|---------------|----------------------|
| P1 | Connector | EHR02 |
| P2 | Connector | EHR03 |
| P3 | Connector | EHR03 (#04) |
| P4 | Connector | EHR03 |
| DS1 | Lamp | HRS-7219A-G40 |
| DS2 | Lamp | HRS-7219A-G40 |
| DS3 | Lamp | HRS-7219A-G40 |
| DS4 | LCD | HLC9235-01-300 |
| EP3 | LOGIC A P.C.B | B-946E |
| EP4 | LOGIC A P.C.B | B-950C |
| W8 | Jumper | MCR10-JPW (#04, #05) |
| W11 | Jumper | MCR10-JPW (#03, #05) |
| W12 | Jumper | MCR10-JPW (#04) |

LOGIC B UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|------------------------|
| IC1 | IC | μPD4028BC |
| IC2 | IC | μPD4013BC |
| IC3 | IC | μPD4030BC |
| Q1 | Transistor | 2SC2458-GR |
| Q2 | Transistor | 2SA1345 |
| D1 | LED | TLR123 |
| D2 | Diode | 1SS133 |
| D3 | Diode | 1SS133 |
| D5 | Diode | 1SS133 |
| D6 | Diode | 1SS133 |
| D7 | Diode | 1SS133 |
| D8 | Diode | 1SS133 |
| D9 | Diode | 1SS133 |
| D10 | Diode | 1SS133 |
| D12 | Diode | 1SS133 |
| D13 | Diode | 1SS133 |
| D14 | Diode | 1SS211 |
| D15 | Diode | 1SS953 (#04) |
| D16 | Diode | 1SS133 (#03, #05) |
| D17 | Diode | 1SS133 (#03) |
| D18 | Diode | 1SS133 (#03) |
| D19 | Diode | 1SS133 (#04) |
| D20 | Diode | 1SS133 (#04) |
| D21 | Diode | 1SS133 (#04) |
| D22 | Diode | 1SS133 (#05) |
| D23 | Diode | 1SS133 |
| D24 | Diode | 1SS133 (#03, #04, #05) |
| D25 | Diode | 1SS133 (#03, #05) |
| D26 | Diode | 1SS133 |
| D27 | Diode | 1SS133 (#04) |
| D28 | Diode | 1SS133 |
| D29 | Diode | 1SS133 (#03, #05) |
| D30 | Diode | 1SS133 (#04) |
| D31 | Diode | 1SS133 (#03, #05) |
| D32 | Diode | 1SS133 |
| D33 | Diode | 1SS133 |
| R1 | Resistor | 5.6k R20 |
| R2 | Resistor | 22k ELR20 |

LOGIC B UNIT

| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|-----------------|-------------------|----------|
| R3 | Resistor | 220k | ELR20 |
| R4 | Resistor | 4.7k | R20 |
| R5 | Resistor | 39k | ELR20 |
| R6 | Resistor | 220k | ELR20 |
| R7 | Resistor | 1M | ELR20 |
| R8 | Resistor | 47k | ELR20 |
| R9 | Resistor | 68k | R20 |
| R10 | Resistor | 120k | ELR20 |
| R11 | Resistor | 68k | ELR20 |
| R12 | Resistor | 47k | RM4 |
| R13 | Resistor | 47k | RM4 |
| C1 | Ceramic | 47P | 50V |
| C2 | Ceramic | 47P | 50V |
| C3 | Electrolytic | 10 | 16V MS7 |
| C4 | Electrolytic | 10 | 16V MS7 |
| C5 | Electrolytic | 10 | 16V MS7 |
| C6 | Barrier Lay | TBD05X103M | 25V |
| C7 | Barrier Lay | 0.0027 | 25V |
| C8 | Barrier Lay | TBD05X103M | 25V |
| C9 | Ceramic | 100P | 50V |
| C10 | Ceramic | 470P | 50V |
| C11 | Barrier Lay | 0.0027 | 25V |
| C12 | Barrier Lay | TBD05X103M | 25V |
| C13 | Barrier Lay | TBD05X103M | 25V |
| C14 | Barrier Lay | TBD05X103M | 25V |
| C15 | Electrolytic | 470 | 6.3V MS9 |
| J1 | Connector | FH3-16S-12.5DSA | |
| J2 | Connector | FH3-16S-12.5DSA | |
| J3 | Connector | B04B-EH-S | |
| J4 | Connector | TLB-P03H-B1 | |
| J5 | Connector | TLB-P02H-B1 | |
| J6 | Connector | TLB-P05H-B1 | |
| J7 | Connector | TLB-P07H-B1 | |
| J8 | Connector | TLB-P02H-B1 | |
| J9 | Connector | TLB-P03H-B1 | |
| J10 | Connector | IMSA-9201B-1-02-T | |
| P1 | Connector | EHR-06 | |
| P2 | Connector | EHR-04 | |
| P3 | Connector | EHR-05 | |
| P4 | Connector | IMSA-9201-HT | |
| P7 | Connector | EHR-05 | |
| S1 | Switch | SGK1042 | |
| S2 | Rotary Encoder | LA21613 | |
| BT1 | Lithium battery | BR2325-1HC | |
| EP1 | LOGIC B P.C.B | B-947E | |

PA (UHF AND VHF) UNITS

| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|-------------|-----------------|
| IC1 | IC | SC1019 |
| IC2 | IC | SC1027 |

PA (UHF AND VHF) UNITS

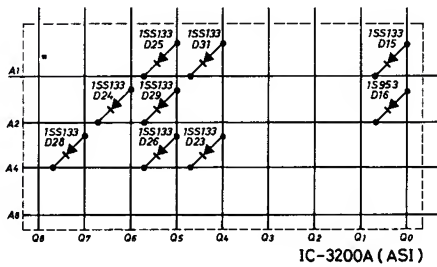
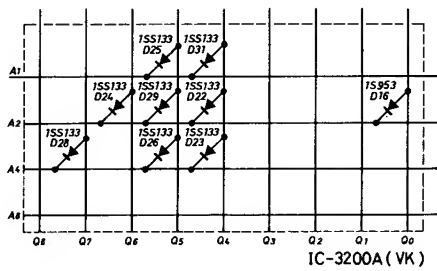
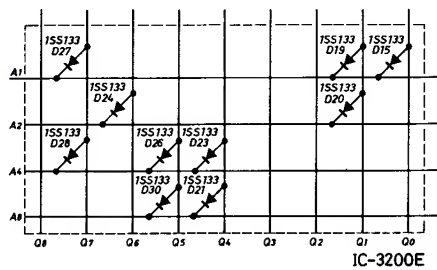
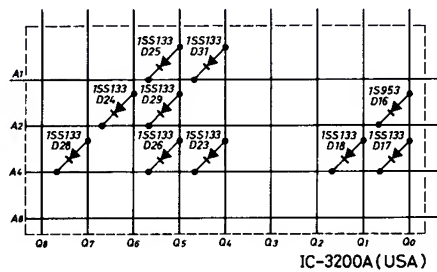
| REF. NO. | DESCRIPTION | TYPE (PART NO.) | |
|----------|--------------|-----------------|---------|
| Q1 | Transistor | 2SA1359-Y | |
| Q2 | Transistor | 2SA1345 | |
| Q3 | Transistor | 2SA1359-Y | |
| Q4 | Transistor | 2SA1345 | |
| D1 | Diode | 15CD11 | |
| D2 | Diode | MI407 | |
| D3 | Diode | 1SS99 | |
| D4 | Diode | MI407 | |
| D5 | Diode | MI407 | |
| D6 | Diode | 1SS99 | |
| D7 | Diode | MI407 | |
| L1 | Coil | LW-25 | |
| L2 | Coil | LA-244 | |
| L3 | Coil | LA-235 | |
| L4 | Coil | LA-263 | |
| L5 | Coil | LW-19 | |
| L6 | Coil | LA-235 | |
| L7 | Coil | LA-238 | |
| L8 | Coil | LA-136 | |
| L9 | Coil | LA-120 | |
| L10 | Coil | LA-242 | |
| L11 | Coil | LA-232 | |
| L12 | Coil | LA-232 | |
| L13 | Coil | LA-232 | |
| L14 | Coil | LA-232 | |
| L15 | Coil | LA-242 | |
| R1 | Resistor | 0.15 | RGB2 |
| R2 | Resistor | 100 | R50 |
| R3 | Resistor | 470 | ELR20 |
| R4 | Resistor | 100k | R20 |
| R5 | Resistor | 10k | ELR20 |
| R6 | Resistor | 0.15 | RGB2 |
| R7 | Resistor | 100 | R50 |
| R8 | Resistor | 470 | ELR20 |
| R9 | Resistor | 100k | R20 |
| R10 | Resistor | 10k | R20 |
| R11 | Resistor | 0.15 | RGB2 |
| R12 | Resistor | 150 | R25 |
| C1 | Ceramic | 0.001 | 50V |
| C2 | Ceramic | 0.001 | 50V |
| C3 | Ceramic | 0.001 | 50V |
| C4 | Ceramic | 0.001 | 50V |
| C5 | Electrolytic | 10 | 16V MS7 |
| C6 | Ceramic | 0.001 | 50V |
| C7 | Tantalum | DNIV | 100MIS |
| C8 | Ceramic | 0.001 | 50V |
| C9 | Ceramic | 0.5P | 50V |
| C10 | Ceramic | 22P | 500V |
| C11 | Ceramic | 0.001 | 500V |
| C12 | Ceramic | 18P | 500V |
| C13 | Ceramic | 39P | 500V |
| C14 | Ceramic | 39P | 500V |
| C15 | Ceramic | 15P | 500V |
| C16 | Ceramic | 0.001 | 50V |
| C17 | Ceramic | 20P | 50V |

PA (UHF AND VHF) UNITS

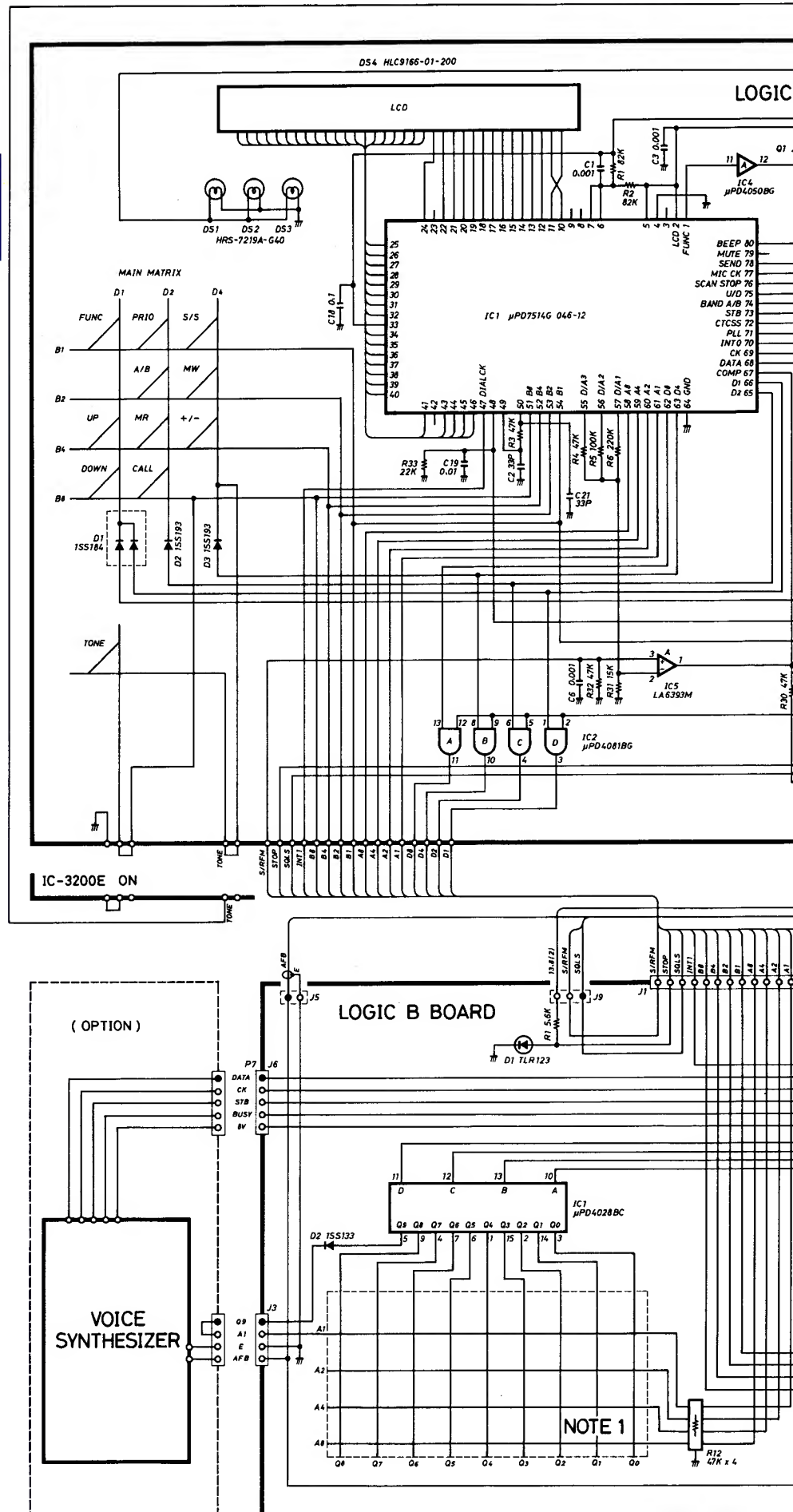
| REF. NO. | DESCRIPTION | TYPE (PART NO.) |
|----------|--------------|---------------------|
| C18 | Ceramic | 100P 500V |
| C19 | Ceramic | 0.001 50V |
| C20 | Ceramic | 0.001 50V |
| C21 | Ceramic | 0.001 50V |
| C22 | Ceramic | 0.001 50V |
| C23 | Electrolytic | 10 16V MS7 |
| C24 | Ceramic | 47P 50V |
| C25 | Ceramic | 2P 500V |
| C26 | Ceramic | 2P 500V |
| C27 | Ceramic | 0.5P 50V |
| C28 | Ceramic | 0.001 50V |
| C29 | Electrolytic | 220 16V (SS) 8 x 12 |
| C30 | Ceramic | 2P 500V |
| C31 | Ceramic | 39P 500V |
| C32 | Ceramic | 6P 500V |
| C33 | Ceramic | 10P 500V |
| C34 | Ceramic | 6P 500V |
| C35 | Ceramic | 6P 500V |
| C36 | Ceramic | 4P 500V |
| C37 | Ceramic | 6P 500V |
| C38 | Ceramic | 4P 500V |
| C39 | Ceramic | 5P 50V |
| C40 | Ceramic | 20P 50V |
| C41 | Ceramic | 20P 50V |
| C42 | Feed Through | TF240-602-332 |
| C43 | Feed Through | TF240-602-332 |
| C44 | Feed Through | TF240-602-332 |
| C45 | Feed Through | TF240-602-332 |
| C46 | Feed Through | TF240-602-332 |
| C47 | Feed Through | TF240-602-332 |
| C48 | Ceramic | 0.001 50V |
| C49 | Ceramic | 0.001 50V |
| C50 | Ceramic | 0.001 500V |
| J1 | Connector | SJ-296 |
| P1 | Connector | EHR-06 |
| P2 | Connector | EHR-02 |
| P3 | Connector | EHR-06 |
| P4 | Connector | EHR-03 |
| P5 | Connector | TMP-P01X-A1 |
| P6 | Connector | TMP-P01X-A1 |
| P7 | Connector | TMP-P01X-A1 |
| P8 | Connector | TMP-P01X-A1 |
| EP1 | Pin | RT-01T-1.0B |
| EP2 | DC Code | OPC-084 |
| EP3 | ANT.Code | OPC-090 |
| EP4 | PA P.C.B | B-944D |
| EP5 | PA P.C.B | B-945C |
| EP6 | Ferrite bead | DL2-OP-2.6-3-1.2H |
| EP7 | Ferrite bead | DL2-OP-2.6-3-1.2H |
| EP8 | Ferrite bead | DL2-OP-2.6-3-1.2H |
| EP20 | Ferrite bead | DL2-OP-2.6-3-1.2H |

IC-3200

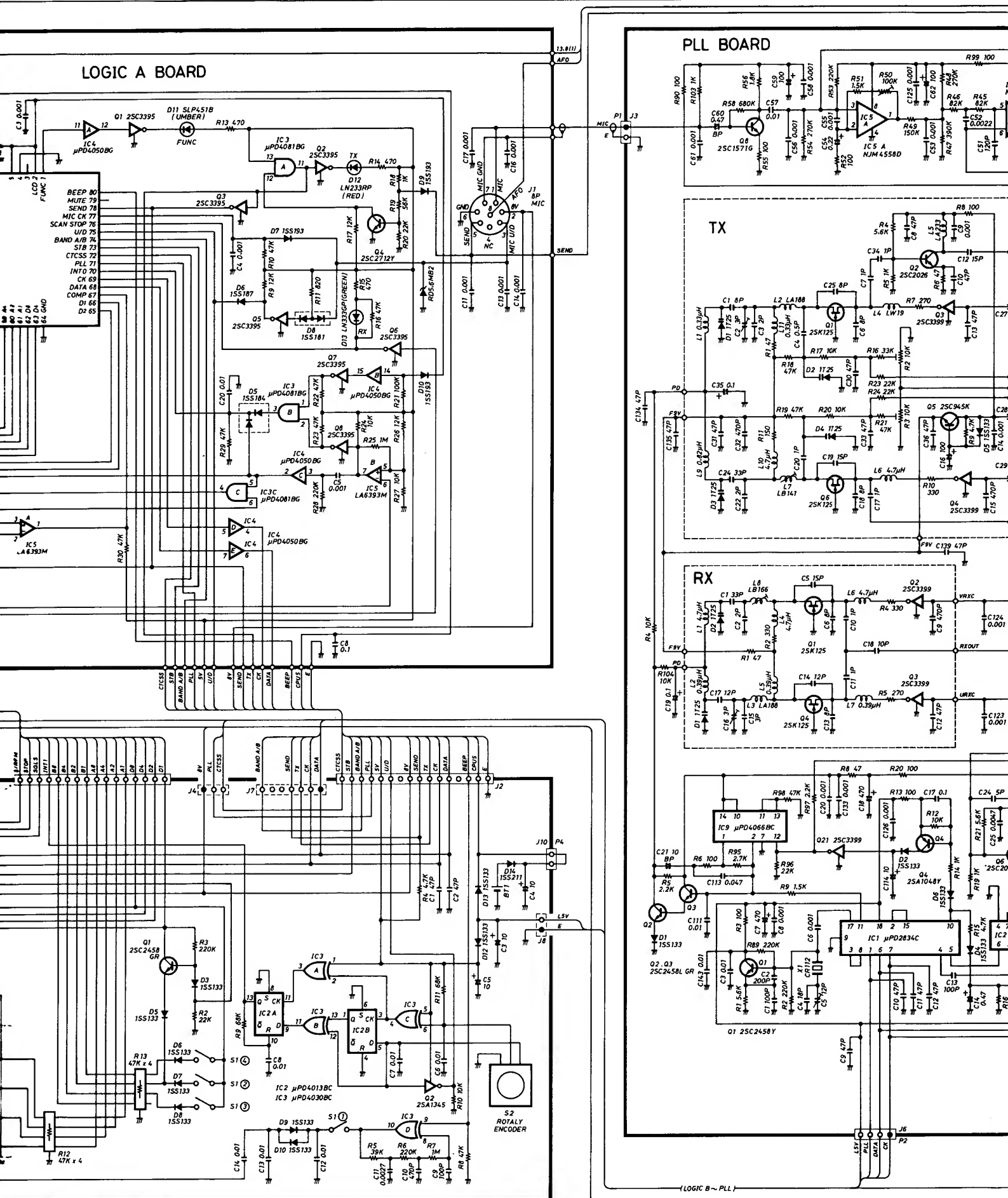
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RadioAmateur.EU



NOTE 1



00A/E SCHEMATIC DIAGRAM



10

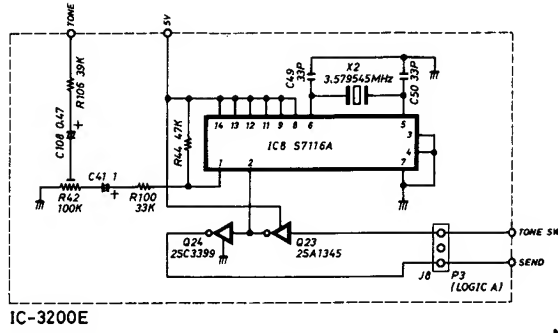
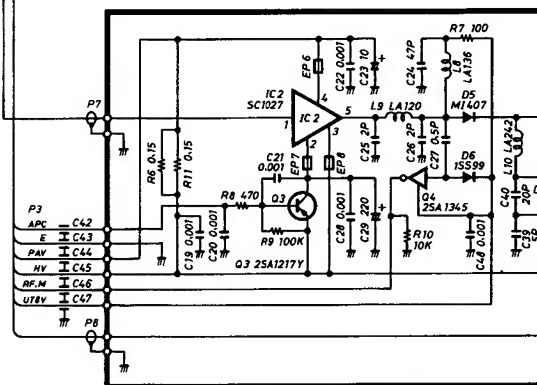


—(PLL ~ MAIN)

| A | B | OUTPUT | |
|---|---|----------------|-------------------------------|
| L | L | Q ₁ | VHF RX8V |
| L | H | Q ₂ | UMF RX8V |
| H | L | Q ₃ | VHF TX ^{8V} 13.8V |
| H | H | Q ₄ | UMF TX ^{8V} 13.8V |

| A' | B' | OUTPUT | |
|----|----|----------------|-----------------|
| L | L | Q ₁ | VHF TX VCO-C |
| L | H | Q ₂ | UMF TX VCO-C |
| H | L | Q ₃ | VHF RX VCO-C |
| H | H | Q ₄ | UMF RX VCO-C |

PA VHF BOARD
(25W)



NOTE 2

